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September 2019

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Eureka!

HEADS UP!

HARNESSING THE SPEED OF LIGHT TO REVOLUTIONISE THE HEAD-UP DISPLAY MARKET

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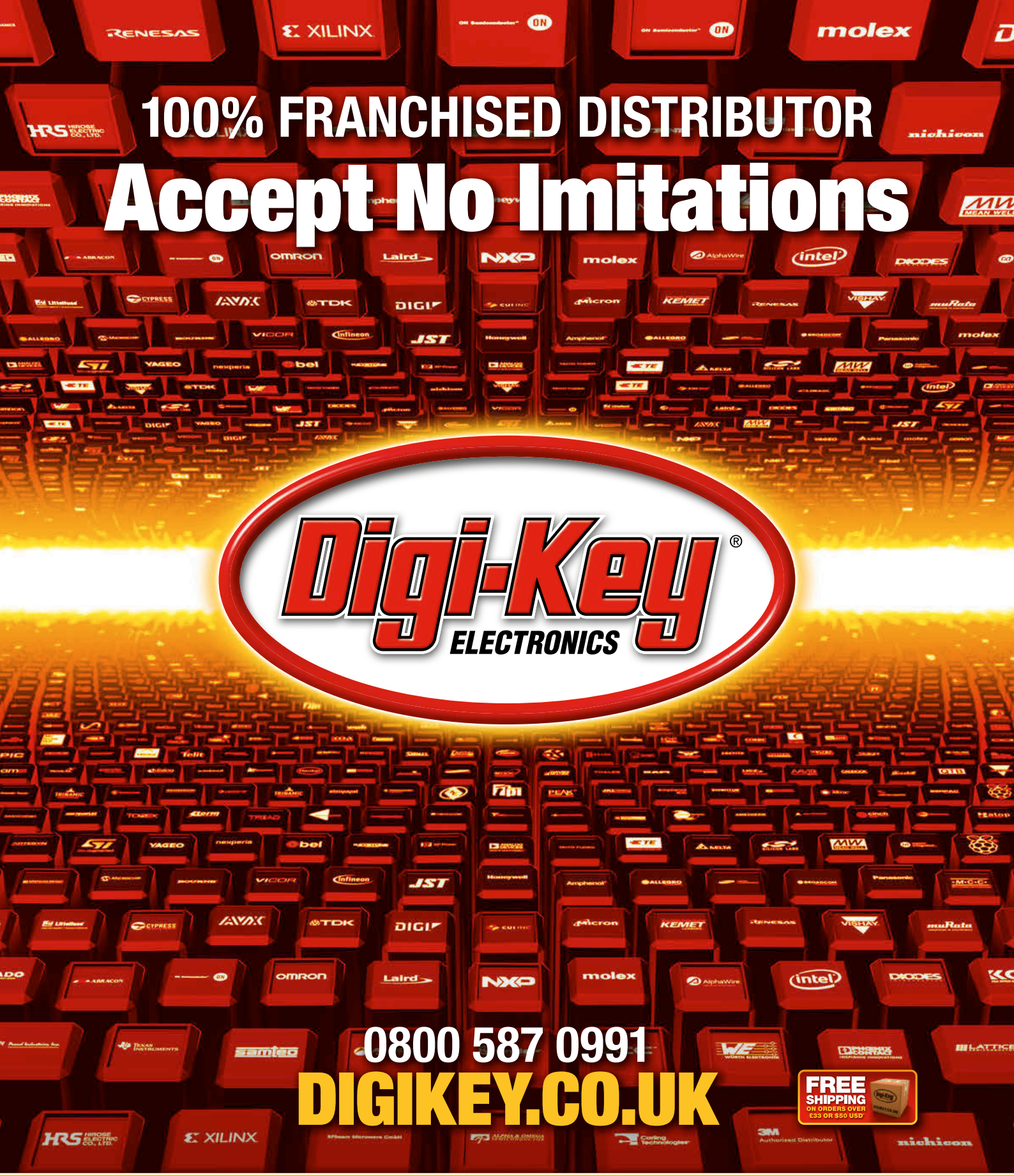

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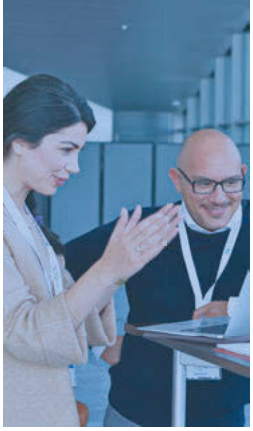

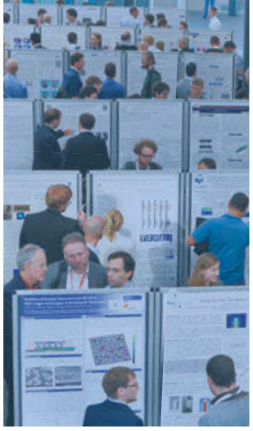


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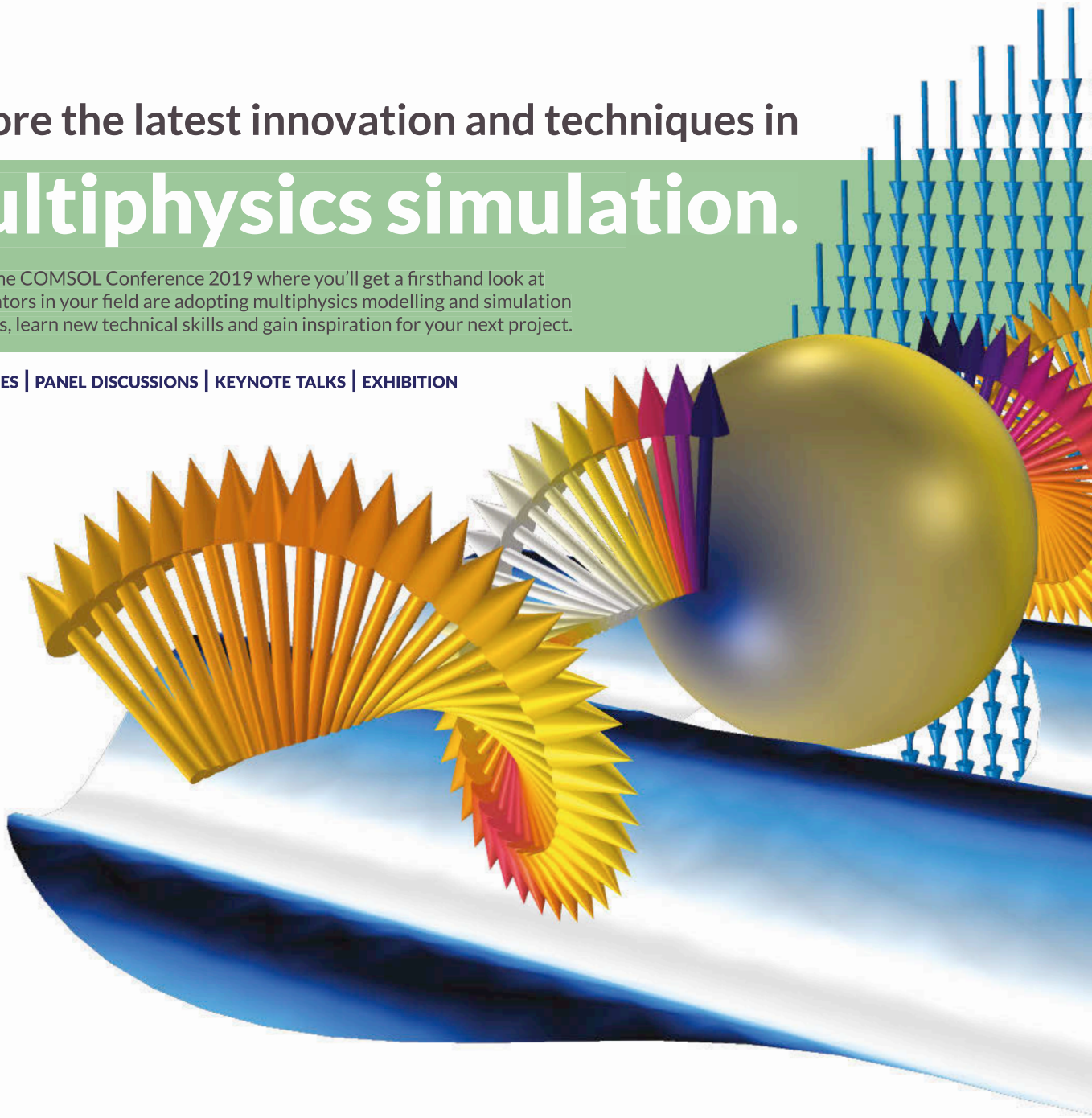

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GO ON WITH THE SHOW

AS WE EMERGE from the relative lull of summer, the frequency of events and exhibitions starts to ramp up and in the time it takes to say 'back to school', one's diary goes from being sparsely populated to jam-packed.

One of the most common features of these busy periods is the trade show. Before the leaves even start to turn, reminders about these key events start to arrive with increasing frequency in one's inbox.

It would be easy to be cynical about such events. There can be times when the last thing one feels like doing is taking a day away from one's desk to make oneself footsore walking around an exhibition hall.

But the fact is that such events work. If they didn't, there wouldn't be so many of them since they simply wouldn't be sustainable. And they work for a relatively obvious reason: face-to-face contact and the ability to discuss one's technical needs with a range of other engineers (and in turn have them explain their products and services) is something it's almost impossible to replicate in any other context.

Of course, Eureka! is associated with a number of exhibitions – indeed, this edition of the magazine previews both FAST/EM LIVE and the Engineering Design Show 2019. and both are excellent examples of what such events can offer to engineers. But this is not a plug for these events so much as it is an endorsement of the format itself and an assertion of its continued value.

Innovation thrives on collaboration and can all too easily wither away in isolation. In busy working days, it is all too easy to decide against 'losing a day' by attending such events, but it is something every design engineer needs to do if they want to make sure their designs are informed by the latest technology and thinking.

Paul Fanning, Editor

MISSION STATEMENT

DESIGN | INNOVATE | ENGINEER

Eureka! connects design engineers with the UK's industrial heartbeat by providing in-depth coverage on the very latest technology developments and industry trends; keeping you inspired, informed and innovative.

Eureka!

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ASVs to seek Amelia Earhart's aeroplane

A TEAM OF researchers, led by US marine archaeologist Robert Ballard, is setting out to answer questions around the disappearance of famed pilot Amelia Earhart during her round-the-world flight attempt in 1937.

Portchester's ASV Global manufactured an autonomous surface vehicle (ASV) with The University of New Hampshire's (UNH) Center for Coastal and Ocean Mapping to explore the seafloor in waters that are too deep for divers.

The ASV, known as BEN (the Bathymetric Explorer and Navigator), will allow Ballard's crew to map the seafloor in the shallow areas adjacent to the island from which Earhart sent her last radio transmission. This area is too deep for divers and too shallow for safe navigation by the scientific vessel, Nautilus, to use its deep-water sonar systems. Maps of the ocean floor produced by BEN will be used to target dives with remotely operated vehicles (ROV) in the search for remnants of the plane.

Credit: University of New Hampshire

Evidence suggests Earhart made a successful landing, likely near the coral reef around the island of Nikumaroro, in the western Pacific Ocean, and was able to transmit radio signals afterward. However, no plane was seen by Navy pilots surveying the islands several days after her disappearance suggesting that the plane may have been pushed off the reef into deeper water.

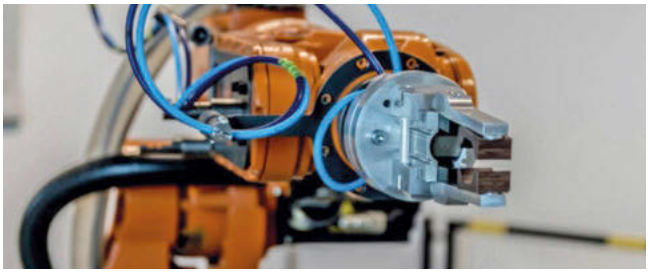
BEN is equipped with state-of-the-art seafloor mapping systems including a Kongsberg EM2040P multibeam echo-sounder and Applanix POS/MV navigation system, which allow it to make 3D topographic and acoustic backscatter maps of the seafloor. The Center has developed mission planning and 'back-seat-driver' control software designed specifically for piloting BEN on its mission.

SMART ROBOTS WILL LEAD TO SAFER WORKPLACES

A NEW STUDY from the National Centre for Nuclear Robotics at the University of Birmingham says robots that work alongside humans will need to better understand the context of the tasks they are undertaking.

Currently, a 'successful' grasp is one where the robotic gripper holds an object securely without causing damage. However, this may be a real-world failure if, for example, the gripper is obscuring a barcode which means that the object cannot be tracked. To be fully successful, the system must understand the consequences of holding the item in the wrong way.

"Imagine asking a robot to pass you a screwdriver in a workshop," Dr Valerio Ortenzi said. "Based on current conventions the best way for a robot to pick up the tool is by the handle. Unfortunately, that could mean that a hugely powerful machine then thrusts a potentially lethal blade towards you, at speed. Instead, the robot needs to know what the end goal is, i.e. to pass the screwdriver safely to its human colleague, in order to rethink its actions."



The paper calls for a new metric for robotic operations to be devised centred on the task which is being performed, rather than just on the various actions that make up the overall task with no reference to whether the ultimate goal of manipulating the object is reached or not.

beeas 2019 shortlist released

MA BUSINESS, PUBLISHER of New Electronics and Eureka! magazines, is delighted to announce the shortlist for this year's British Engineering Excellence Awards (BEEAs).

Luke Webster, publishing director of MA Business, said: "This is the 10th Anniversary of the British Engineering Excellence Awards and as long as they have been in existence, they have been the benchmark for great British engineering design. I'm delighted to say that this year is no exception, with an exceptionally diverse and fascinating set of entries.

"As befits such an important anniversary, this year we will not only be celebrating the present and future of British engineering, but also honour the winners of the past with the 'Design Engineer of the Decade' category. In this way, we hope to celebrate everything that's great in British engineering design."

The companies shortlisted in each BEEAs category are listed to the right. The winners will be announced at a gala lunch at The Landmark London, on Friday 11th October.

To join in the celebration of British engineering, tables for the lunch can be booked online at: **www.beeas.co.uk/book-a-table**

2019 SHORTLIST

10TH ANNIVERSARY

CONSULTANCY OF THE YEAR
Bennett Engineering Design Solutions
ByteSnap Design
Drive System Design
Spacechips

DESIGN TEAM OF THE YEAR
Synergie Environ
Airport Integrated Low Carbon Energy Systems Design
Oxford Instruments NanoScience
Designing greener high magnetic fields
EarthSense & Bluefrog Design
Development of the Zephyr Air Quality Sensor
Salamander Pumps
EVE
Nanusens
NEMS-within-CMOS
DRB Group
Unilever R&D detergent plant platforms

ENGINEERING AMBASSADOR
Beth Faulkner, DRB Group
Darren Williams, TWI
Energus, nucleargraduates
Laura Giddings, RS Components
Leonardo
Rapid Electronics

MATERIALS APPLICATION OF THE YEAR
Alvant
AlXal brake rod
Alvant
CorXal
Plessey Semiconductors
Native Green GaN-on-Si microLED
Zircotec Group
ZircoFlex Heat Shield

NEW PRODUCT OF THE YEAR (ELECTRONIC)
Beryl
Beryl Bike
EAVE
EAVE Focus Lite
Grayson Thermal Systems
GTS BTMS (Battery Thermal Management System)
Plessey Semiconductors
microLED Emissive Display
Nanusens
NEMS nanosensors family
Peratech
Peratech QTC based EDGE Solution
Quanta Dialysis Technologies
SC+
Siretta
SNYPER-LTE Graphyte

NEW PRODUCT OF THE YEAR (MECHANICAL)
Terex
AggWash 300
ELE International
AUTO Soil Consolidator (ASC)
Bowman Power
ETC 1000
LDS Hire & Sales
G-DECK
Diamond light source
Interference fit monochromator cooling system
Johnston Sweepers
Johnston VE652 aka EVIE
Wilson Tool
PX QuickTap
Russell Finex
Russell AMPro Sieve Station
JR Dynamics
Smart Oil Plug
Aeristech
Centrifugal Compressor

SMALL COMPANY OF THE YEAR
Alvant
Bennett Engineering Design Solutions
Generative Parametrics
Innovative Physics
Nanusens
Precision Acoustics
Spacechips
Synergie Environ

START UP OF THE YEAR
Automata
Nanusens
Spacechips

YOUNG DESIGNER OF THE YEAR
James Veale
GiroNEX
Matthew Ringland
Spiroflow
Sam Edwards
Azbil Telstar

DESIGN ENGINEER OF THE DECADE
Mark Sanders
2009 winner
Andrew Burrows
2010 winner
Shaun Addy
2011 winner
James White
2012 winner
Sebastien Cuvelier Mussalian
2013 winner
Peter Greenhalgh and Mike Franklin
2014 joint winners
Richard Poulton
2015 winner
Alexander McDiarmid
2016 winner
Jake Willis
2017 winner
Orla Murphy
2018 winner

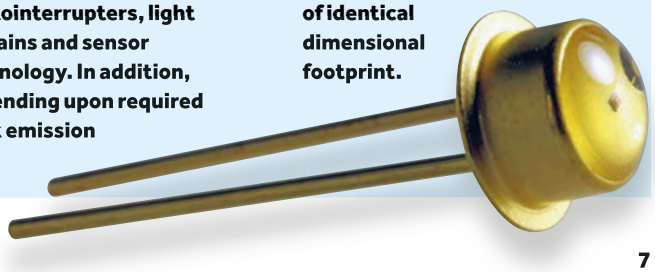
TECH **BRIEF**

ACCURATE, RELIABLE SENSING

Marktech Optoelectronics has released the Model MTE6063M-UHR, a new family of visible red LED emitters, designed to provide high-accuracy, high-reliability sensing within a variety of applications.

The emitters offer high output power, typically 27.5 mW, along with a wide radiation pattern, and a peak emission wavelength of 630 nm. Each is packaged within a TO-18 metal can with drip lens encapsulation, with the anode electrically connected to the case. Units are lead-free and RoHS compliant. In addition, alternate package and sorting options, as well as custom and hybrid designs, may be produced in as few as six to eight weeks from the point of customer prototype approval.

Typical applications include optical sensing, optical instrumentation, linear and rotary encoders, machine vision and CCD, photointerrupters, light curtains and sensor technology. In addition, depending upon required peak emission wavelength, standard Model MTE6063M-UHR visible red LED emitters may be used as direct drop-in replacements for end-of-life industry GaAsP, AlGaAs or InGaAlP visible LED emitters of identical dimensional footprint.



MOVERS & SHAKERS

TWO ENGINEERING PROMOTIONS AT DIAMOND LIGHT SOURCE

Stewart Scott has been promoted to head of the engineering group at Diamond Light Source, the UK's national synchrotron, and Sarah Macdonell has been promoted to head of beamline systems engineering and engineering group quality and resource manager.

4M NAMES INTERIM CEO AND CHAIRMAN

Paresh Chari has agreed to take over the role of Chairman and Interim CEO at 4M Carbon Fiber Corporation. Chari has been on 4M's Board of Directors since March 2018, he recently retired from Duraline Corporation and its parent, Mexichem in January 2019.

LUCIDEON FUELS BUSINESS GROWTH

Materials technology company, Lucideon has appointed Chris Bill to the role of chief finance officer and Amanda Chu as Finance Director.

TWO PROMOTIONS TO TDK-LAMBDA UK'S BOARD

Jonathan Scott and Tim Puttick have been added to TDK-Lambda UK's Board. Promoted to sales director, Scott has developed the company's UK sales for 13 years. Having been with the company for almost 15 years, Puttick's promotion to manufacturing director brings a wealth of technical knowledge and talent.

UK HGV platooning begins

THE FIRST REAL-WORLD operational trial of platooning vehicles is due to take place later this year. The £8.1 million trial, funded by the Department for Transport (DfT) and Highways England, includes TRL, DAF Trucks, DHL, and Fusion Processing.

A bespoke version of Fusion Processing's CAVstar system will be fitted to three DAF Heavy Goods Vehicles (HGVs) to enable them to travel safely, in close proximity, at speed, with the lead driver controlling the speed, acceleration and breaking of the whole 'platoon'.

Use of platooning has the potential to greatly increase fuel efficiency, reduce carbon emissions and improve safety.

Jim Hutchinson, CEO, Fusion Processing, said; "Working alongside global brands such as DAF, TRL and DHL demonstrates the robustness of our system to gather vital data that will ultimately inform the rollout of this technology to real-world applications."

The on-road trials will form part of regular DHL logistical operations. The first phase is

expected to take place later this year, following the successful completion of a rigorous programme of driving simulations, driver training and test track trials over the coming months.

ROADSHOW ROLLS INTO MANCHESTER

FOLLOWING SUCCESSFUL DAYS in Northampton and Dublin, Novotek UK & Ireland and GE Digital will deliver a free industrial digitalisation discovery day at the Science and Industry Museum, Liverpool Road, Manchester, on September 25.

The event will offer a thought-provoking exploration of how business can harness changing information and operational technologies (IT and OT) to achieve flexibility and reduce costs. Attendees can learn how to best deploy next-generation tools,

particularly as many companies are unsure of how to apply these technologies effectively.

"While organisations are rushing to invest in machine learning or data platforms, we see many missed opportunities to layer new capabilities around existing solutions. Businesses can take steps to ensure that new tech provides benefits across multiple parts of their operation," explained Sean Robinson, software and services manager at Novotek UK & Ireland. "A key objective of the digitalisation days is to educate manufacturers on how best to apply the latest developments in industrial automation and digital transformation within their own business."

Register for tickets at Eventbrite

TECH **BRIEF**

LONGER LIFE, LESS NOISE, LOWER FRICTION

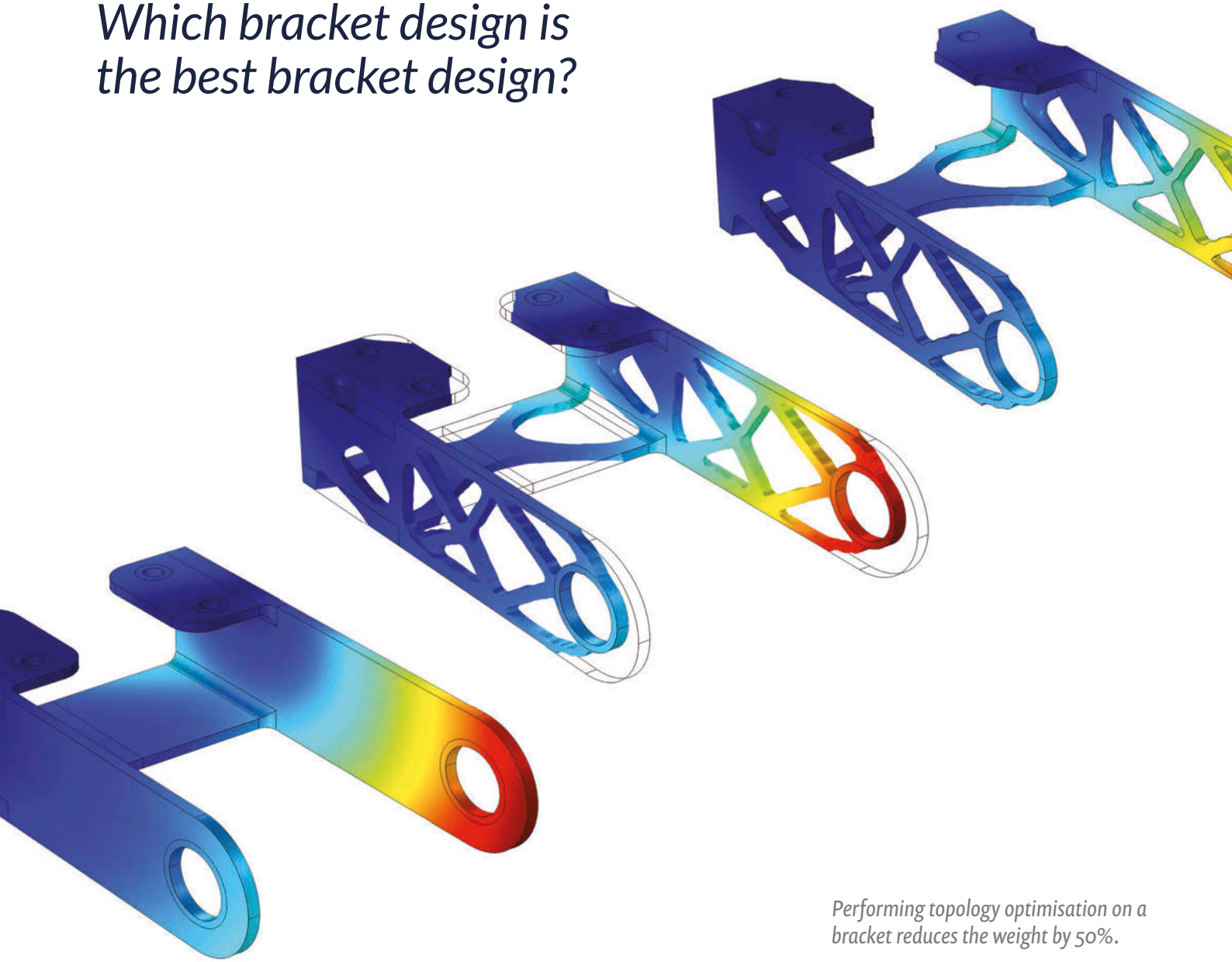
SCHAEFFLER has developed two new sealing concepts for its Generation C bearings which reduce grease loss and better protect against contamination to extend the grease operating life and therefore that of the bearing.

The new Z-type dust shield with its innovative labyrinth seal, helps reduce grease loss by 20%, and reduces contamination by 30% compared to the previous design. Its optional ELS lip seal provides maximum sealing at low friction and is particularly suitable for alternating axial loads.

A noise-optimised cage enables Generation C bearings to run at significantly reduced noise levels compared to conventional deep groove ball bearings. Generation C bearings run with even lower friction due to improvements to raceway parameters in terms of roundness, waviness, roughness and tighter manufacturing tolerances. Reduced friction also means lower energy costs during operation.

The Generation C bearings are suited for use in motorcycle wheels and electric motors in electrical consumer goods such as washing machines, dishwashers, fans and power tools.

Which bracket design is the best bracket design?



Performing topology optimisation on a bracket reduces the weight by 50%.

It depends on the design goals. Topology optimisation methods find the best possible version of a structure for a specific use. One bracket can be optimised for a single load, while the other is optimised for eight. The Density Model feature simplifies the topology optimisation process for structural engineers.

The COMSOL Multiphysics® software is used for simulating designs, devices and processes in all fields of engineering, manufacturing and scientific research. See how you can use it for topology optimisation.

comsol.blog/density-topology

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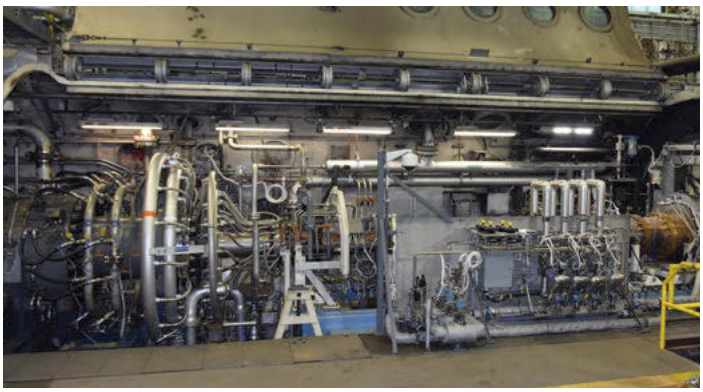
Experimental hypersonic scramjet sets thrust record



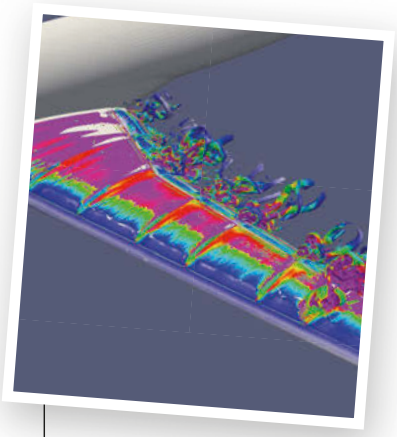
AN EXPERIMENTAL NORTHROP Grumman scramjet has set a new US Air Force record for the highest thrust produced by an air-breathing hypersonic engine.

During ground tests conducted by the Air Force Research Laboratory (ARFL) and Air Force Test Centre, the engine delivered more than 13,000 pounds (57,850 Newtons) of thrust. The nine-month test programme at Arnold Air Force Base, Tennessee saw the 18-foot scramjet deliver a combined 30 minutes of combustion time, performing in test conditions that simulated speeds in excess of Mach 4. Hypersonic flight is generally accepted as Mach 5 and above.

According to the AFRL, the engine was born on the back of the X-51 Waverider programme, an experimental scramjet built by Boeing that launches from under the wing of a B-52 bomber. In May 2013, the X-51 reached speeds in excess of Mach 5 for 210 seconds, making it the longest duration hypersonic flight ever.

Before ground testing could even take place, the Arnold Engineering Development Complex on the Air Base had to undergo a two-year upgrade, as no existing US test facilities could produce the requisite airspeeds or thermal conditions.

"Our collective team has worked hard over the past few years to get to where we are today," said Sean Smith, lead for the AEDC Hypersonic Systems Combined Test Force ground test team. "These groundbreaking tests will lead the way for future hypersonic vehicles for a range of missions."



CFD FOR AEROSPACE

THE CENTRE FOR Modelling & Simulation (CFMS) has teamed up with Zenotech, Aircraft Research Association and Bombardier to develop a high-order computational fluid dynamics (CFD) technology for the aerospace industry.

The £1.55 million Aero Flux project, which is part funded by the Department for Business, Energy and Industrial Strategy (BEIS), the Aerospace Technology Institute (ATI) and Innovate UK, will enable the R&D of advanced high-order CFD methods beyond baseline technologies currently used by the aerospace industry.

The three-year project, which is being led by CFMS, will develop the capability for fluid-structure interaction, broadband acoustics, accelerated time-stepping, advanced high-order mesh generation and multi-disciplinary coupling. This will address the latest aerospace requirements with a greater level of accuracy.

Sam Paice, CEO at CFMS, said: "This will generate new opportunities, challenges and novel innovation, where physical testing of the end product will be reduced and the efficiency, speed and cost of the product development process will be improved."

SOLUTION TO LAST MONTH'S COFFEE TIME CHALLENGE

MICRO-EPSILON

The solution to last month's Coffee Time Challenge, which was to come up with a device that removes or covers up skin blemishes like a real-life Instagram filter, is the Opté Precision Skincare System from consumer goods giant, Procter and Gamble.

The handheld device, which is basically a tiny inkjet printer, uses sensors to detect the colour and the pigmentation of your skin, spots blemishes and precisely applies tiny droplets of makeup that are the exact colour of the surrounding skin.

It takes 200 pictures of your skin per second and 120 nozzles deposit one billionth of a litre of makeup onto each skin spot it detects.

According to Lauren Thaman, communications leader, P&G Ventures, the device will work on all skin tones with light, medium or dark cartridges available. She adds that the make-up is anti-ageing so blemishes like age spots will disappear over time and it won't perspire off because so little skin is being covered.

GRIVORY® EMS

Q&A

✆ +44 (0) 1785 283739 ✉ sales@uk.emsgrivory.com www.emsgrivory.com

NEW Grilamid TR For Healthcare & Medical Applications

Q What is Grilamid TR?

Grilamid TR is an amorphous high performance polyamide from EMS-GRIVORY. EMS is market leader and offers more than 100 products under the brand name Grilamid TR. These products are highly transparent polyamides which can be processed using thermoplastic methods.

Q What material approvals are necessary?

The grades Grilamid TR 90, Grilamid TR ICR 12, Grilamid TR 55, Grilamid TR 60 and Grilamid XE 11292 satisfy all requirements of the European guidelines for use in contact with drinking water and foodstuffs as well as the American guideline FDA CFR 21 (Food and Drug Administration, Code of Federal Regulations 21). They also correspond to the testing requirements as per the United States Pharmacopoeia (USP) Class VI and are certified according to the 3-A Sanitary Standard.

Q How to select the right material?

A growing concern with medical devices is a tendency of many polymeric materials to craze or crack when exposed to solvents, including the chemical disinfectants typically used in healthcare environments. Different chemicals can affect a polymer in different ways. A polymer can be resistant to one chemical (that is, suffering no property loss or discoloration), but easily crack when exposed to another chemical. This phenomenon can occur when medical equipment is repeatedly wiped down by disinfectants. Choosing a polymer that resists cracking after exposure to cleaners and disinfectants can eliminate the growing number of cracked polymer components seen with medical equipment.

Amorphous polymers such as PC, ABS, PMMA, PS and SAN but also some semi-crystalline polymers are very sensitive to stress cracking. Grilamid TR products are NOT sensitive to stress cracking and thus contribute to a longer service life for healthcare and medical applications.

Hard and soft overmoulding has become a fundamental technique for medical component designers in recent years. In medical applications, Liquid Silicone Rubber (LSR) offers advantages over other polymeric soft materials such as TPE and TPU in its chemical resistance, heat resistance and flexibility.

EMS offers two amorphous polyamides that are well suited for overmoulding with LSR. Grilamid TR 60 with its Tg of 190 °C and the new developed TR XE 11292 with its Tg of 200 °C. Due to its well-balanced Tg both materials can be overmoulded in a reduced cycle time, while using higher curing temperatures, without risking any deformation (warpage).

Q Is Grilamid TR suitable for steam sterilisation?

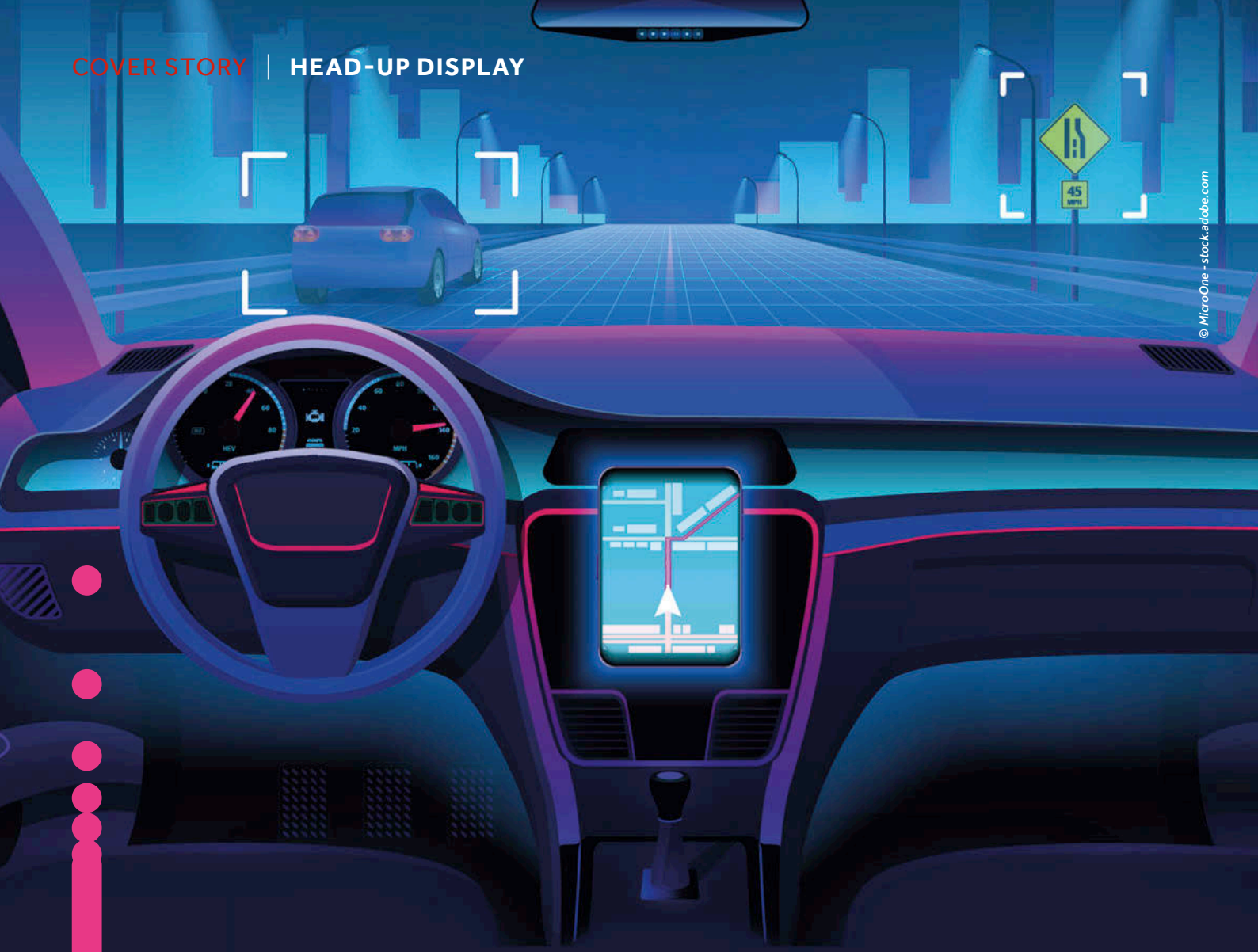
Reusable medical devices or medical instruments always carry a degree of risk for cross-contamination. Among other regulations, the Medical Device Regulation (MDR) categorizes medical devices for the multiple-use in three classes. Devices listed in category 3 (invasive devices) are only for single-use. However, plenty of non-invasive devices mentioned in class 1 and class 2 are allowed for multiple-uses.

Steam sterilisation, also known as autoclaving, is a proper method using saturated steam at a temperature range of 120 -148 °C at high pressure for a period of time sufficient to provide sterilisation. Transparent polyamides were not suited for this kind of sterilisation process until now. With the new TR XE 11292, EMS-GRIVORY developed the first transparent polyamide suitable for steam sterilisation.

The application area for the new TR XE 11292 is wide-ranging. Due to its crystal clear transparency, high mechanical strength and toughness and its high chemical resistance TR XE 11292 can be used for multiple-use applications requiring high transparency, such as transparent pump containers, filters, steam valves, containers, boxes and tool boxes, ventilation masks, windows and many more. EMS-GRIVORY stands for reusable instead of disposable!

Q How can EMS-GRIVORY support?

EMS-GRIVORY offers the broadest assortment of Polyamides and knowing it's products first-hand is able to find for every application the adequate material. As a strong development partner EMS-GRIVORY supports its customer along the whole development process from feasibility studies to serial production.



HEADS UP!

A British technology company has been working stealthily for several years harnessing and learning to control the speed of light to revolutionise the head-up display market with its 'superior' Dynamic Holographic Platform.

At the beginning of 2019 at the Consumer Electronics Show in Las Vegas, Envisics – a technology company based in Milton Keynes – unveiled a holographic head up display (HUD) platform for vehicles.

The company had been operating in 'stealth' for around nine years to perfect its technology. However, its roots go back to Cambridge University, where CEO and founder, Dr Jamieson Christmas undertook a PhD between 2004 and 2009.

"I elected to research holography over a very wide range of different topic areas, but the central project I undertook was my PhD thesis which was to try and make holographic displays a reality, understand the problem and move the needle forward," he says. "At the time the big hype in the market was going to be pico projectors, everyone assumed your cell phone would be able to project a 30-inch picture on the wall and initially that was my target."

However, the worldwide financial crash in 2008 meant the Alps Group, a Japanese conglomerate that Dr Christmas was working for, decided it was going to retract its engineering operations from the UK. So, with Alps UK's president Peter Woodland, he created a company, Two Tree Photonics, around the core technology he pioneered at Cambridge.

"The first thing we did was

look at the best place to use this technology. Where should we target it?" Dr Christmas explains. "One area that was relatively stable in the wake of the economic shock was the automotive market because it runs such long schedules. From the start of a concept to producing a vehicle takes five years plus, so, a lot of those vehicle designs were in process and they had to continue. They could sustain the higher price points than the commercial markets and the technology had a really strong application in that space. So, we set about converting the technology into a head up display application and we attracted interest from Jaguar Land Rover.

"We met with Bob Joyce, CTO of JLR at the time, and he said: 'that's the technology we want'. So, we partnered back with Alps, we did the design, they did the manufacturing and qualification."

By October 2014 the first units rolled off the production line in Japan and the first JLR models with Two Trees Photonics' laser holography HUD platforms shipped in 2015. The company received a huge amount of interest as the technology 'came out of the blue', leading to a buyout by American West Coast augmented reality company DAQRI in 2016. DAQRI asked Dr Christmas' team to redesign the platform for smart glasses. But attention from the automotive industry never went away and so in 2018, the companies separated and Envisics was formed.

Envisics' Dynamic Holographic Platform projects driving information, route information and warns of danger clearly on multiple planes using just one projector.

"We've had to develop a hybrid silicon device that allows us to electronically control the speed of light... that really is at the heart of the technology of the company"

"Of course, in the two years where we'd been acquired, we didn't sit on our hands and do nothing, we made a lot of progress in terms of the core technology development," says Dr Christmas.

"The next six months was about realising an automotive product from that technology development.

"We had a booth at CES and invited numerous automotive companies to come and see us. Everybody that saw it was absolutely blown away, hugely impressed. No-one had ever seen anything quite like it: Compact HUD design; large image size; augmented reality; in a vehicle. All the things that traditionally have been very difficult to do, there they were in high quality," he continues.

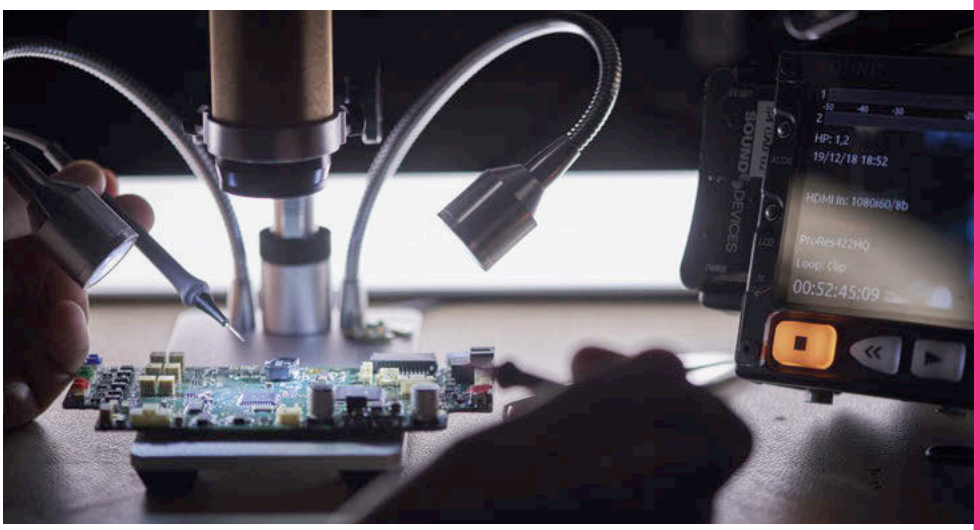
"It's never a straight path. The journey is always the interesting part and we're on a really exciting journey. It's just absolutely full on. We have much more interest than we can reasonably deal with. We're growing the company as quickly as we can to recognise and realise that and it's really really exciting."

Envisics now has two offices, one in Milton Keynes that employs 32 people, and one in Detroit employing 13 people, around half of whom are PhDs, expert scientists and engineers.

MULTIPLE PLANES

HUDs in cars are nothing new, BMW for example has had them in some models for several years now. However, existing technologies use LED backlit LCD screens to render images on only one plane and squander more than 90% of the illuminating light available when projecting imagery onto the windscreen because of the pixels opening and closing to let light through from behind. Additionally, this creates heat, which also wastes energy.

Envisics' Dynamic Holographic Platform is around half the size »



» because it uses just one projector and algorithms that project and redistribute the light precisely where and when it's needed, wasting no light whatsoever. While consuming half the power, this one projector can also generate multiple planes at different distances, with resolution and clarity six times that of the human retina – day and night; sunny or overcast – the holographic technology means that even if modulator defects occur, image degradation is imperceptible. This technology far exceeds today's automotive requirements.

"The maths involved is insane. The device science is even more insane," Dr Christmas states. "We've had to develop a hybrid silicon device that allows us to electronically control the speed of light.

"Everyone says the speed of light is a constant. It kind of is; it's constant in a vacuum. But you can make light slow down and speed up by changing the density of the medium it's travelling through," he explains. "This silicon device is completely unique to us, we've developed all the materials science and, believe it or not, it contains 2 million light speed modulators. That really is at the heart of the technology of the company."

Envisics also developed another chip which is the calculation engine that allows the team to decide what to write on the first device. Dr Christmas says it simulates how light propagates through space.

"Today, that chip performs 150,000 million calculations a second. 150 gigaflops," he says. "The scale of the problem we're addressing here is so vast that it's really quite unique. The net result is, by doing all this maths and making a device that messes with the speed of light, we're able to create really high-quality images that are significantly beyond the resolution of the human eye. When we talk about retina display on phones – an equivalent space – our images are much higher resolution than those retina display images, and we can project them in multiple dimensions simultaneously.

"The net result is that we can create a much more compact head-up display that is much more efficient, much sharper, much brighter than any other competing technology."

ENGINEERING CHALLENGES

Even with the maths and the device in place, there's a significant engineering task to then convert these into a product that is applicable to automotive use. An electronic product that goes in the cabin of a car must be guaranteed to work from -40°C to 85°C. Thankfully for Envisics, the automotive industry has gathered mountains of data over the years that pinpoint each criteria that need to be met to meet and exceed these constraints.

"Taking something which is fundamentally new and revolutionary and making it work over these huge extremes of temperature ranges is a »

FIVE WAYS HOLOGRAPHY BEATS LEDS

SAFER – NO DISTRACTIONS

Envisics' Dynamic Holography Platform delivers augmented reality (AR) imagery on different planes and at different distances, simultaneously. It adapts instantly to ambient light changes, projects virtual colour imagery and accurately reads the road ahead. Distortion is undetectable and there is no distraction.

SMALLER – MORE FLEXIBLE

It is small, flexible and easily adaptable across manufacturer models. Car crossbeams, heating, ventilation and air conditioning fight for space, so size and weight are key. Ultra-high magnification enables a wide field of view from a compact package, making it suitable for vehicles of all sizes from all corners of the world.

SHARPER – RICHER IMAGERY

By harnessing and controlling lasers, Envisics' technology generates imagery with unmatched levels of clarity, depth and stability, with no graining or detectable distortion.

EFFICIENT – LESS POWER CONSUMPTION

No backlight means greater optical efficiency. Envisics' heatsink-free design helps realise smaller packaging. The HUD has greater brightness and consumes 50% less power; in the age of electric vehicles, every milliamp counts.

ADAPTABLE – GREATER PERSONALISATION

Automakers can create different cockpit environments, matching AR experiences to a specific model and to individual driver and passenger preferences. More than ever, this is how automakers will seek to create distinction from one another.

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» very significant undertaking,'' says Dr Christmas. ''Then, throw into the mix the fact that each windshield is at a different angle and has a different curvature, the available space beneath the dashboard is different. So, you've got all of these compound challenges, and you have to meet all the different regulations and specifications for each one.''

For each individual vehicle model, the automaker provides Envisics with CAD data from the vehicle for them to work out where the platform can be installed, how it will be packaged and the angle at which it needs to be projected onto the windscreen (in some cases they're working to vehicle designs that aren't even finished yet). Then Envisics, which is the technology provider – not a manufacturer of HUDs – works closely with Tier 1 automotive suppliers to deliver each version of the HUD to market. Dr Christmas says that as long as the rake of the windscreen isn't 90° to the dashboard, and there's enough space for the HUD inside the dashboard, it can be configured to project effectively.

He adds: ''The Tier 1 has to qualify the product, but we have to qualify the technology that goes into the product.''

Similarly, the interface between the HUD and individual OEM's in-vehicle software is dealt with by the Tier 1s.

VISUAL AMPLIFICATION

Fundamentally, a HUD is a safety feature that is designed to enhance the driver's situational awareness. As well as putting driving information, like the speedometer, on the windscreen saving the driver's eyes from travelling too far from the road, Envisics' dynamic holography means that the information can be displayed as though it is 2.5 metres in front of the windscreen.

This effect is hard to visualise on the page or even in a video, however experiencing it really is immersive. The driving information does look like it's floating ahead of the car, saving your eyes those vital split-seconds to refocus where you're effectively driving blind. Plus, it still allows you to use your peripheral vision around the display rather than driving on memory while looking down to the in-car instrument cluster.

The other thing that being able to project images on multiple planes allows Envisics' HUD to do is act as an early warning system when it is interfaced with the vehicle's ADAS system. It can pick out vehicles pulling out of side streets or pedestrians stepping off the pavement and draw the driver's eye to it by placing a red diamond over the possible hazard.

''This is a very crude, but absolutely real example of how we can orchestrate the driver's gaze to ensure they've picked up on things that are going on around them,'' says Dr Christmas. It can also show route information, direct you to points of interest and even allow the OEMs to brand their vehicles in their own way as exterior car designs become more homogenised.

Currently the HUD is being tested on the roads of Detroit. The first vehicles to have the HUD platform built in are expected to be released in 2022.

THE NEXT GENERATION

Envisics is currently working on Generation 3 of the platform which Dr Christmas says will be ''utterly transformational''.

''We are improving design, power efficiency, brightness and there are many other things that we can work on,'' he explains. ''The Gen 3 technology will be as capable, but it will be flat like a book. What we're doing is unlocking more of the holographic potential and using holograms themselves to correct for the distortions in the windshield. That means the mirrors, that take up the most space in the package, will disappear. It will be a completely different design and approach which can fit many more vehicles.''

He is not at liberty to say what kind of vehicles, in what markets, or how the holograms will pre-compensate for distortions in the windscreen because the R&D is ongoing, and IP is constantly being generated. There is a working prototype and he says it has demonstrated that the principles are sound. If things go well, the Gen 3 platform will be on the market by 2025.

The roadmap currently includes a Gen 4 platform that could be used not just in vehicles but in illumination and entertainment. The ultimate example of holograms in entertainment is the Star Wars projections of Princess Leia or maps that float in thin air. Unfortunately, this is probably never going to happen, because a reflective surface is needed to bounce the light towards the viewer. However, there is a workaround.

''The truth is it's a compute problem, the device science is almost there,'' Dr Christmas explains. ''It requires a further evolution from Gen 3. If you think 150,000 million calculations per second is a lot, it's probably 100 times that compute to have full-motion 3D movies.

''Could you have it on the wall, and see Princess Leia standing in front of you? Absolutely. And we're not a million miles (far, far) away from it.''

New Electronic Digital Position Indicators

DD52R-E-RF

New system with radio frequency transmissions (RF)

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STANDARD MACHINE ELEMENTS WORLDWIDE

START SPREADING THE NEWS

It's all very well there being powerful digital tools available, but people have to know how to use them. Autodesk's Digital Catalyst programme aims to confront that issue. Andrew Allcock explains.

Autodesk's digital catalyst programme started about four years ago, off the back off the company asking what it could do to make a difference to UK GDP, explains Asif Moghal, senior industry marketing manager, design and manufacturing.

In visiting companies and asking them what their challenges were, he says: ''The same thing kept coming back: they were too busy to go and explore what's possible; what they thought was impossible was very easy to do; and they lacked an up to date digital design and manufacturing strategy. They all wanted to do something; they all recognised that the fourth industrial revolution [Industry 4.0] was coming, but most of the things that they were being offered were going over their head. They just wanted to get something done, they knew what they wanted to do, but didn't know if it was possible and needed help to get to move forward.''

Above right: Asif Moghal is a senior industry marketing manager, design and manufacturing, at Autodesk.

So, the Digital Catalysts programme that makes use of Digital Ambassadors – students that spend time with companies giving their time and knowledge – was the result.

Moghal says: ''What we found was that students have a mindset that sees them apply design thinking to traditional problems that allows them to shake up the status quo in a positive way, showing companies what's possible, hopefully creating an upward spiral. It is not just focused on productivity – stripping cost and risk out of a business, but should be adding value, creating opportunity and innovation.''

Digital Ambassadors can spend up to, typically, 80 hours with a company, which can be spread out over a few weeks. The range of work tackled is broad but must involve ''digital transformation'', with it having an impact on the way a company designs or makes, underlines Moghal. He says that one of the strengths of Digital Ambassadors are that they are generalists. ''They know how to go and find information, research it, understand it and then apply it, without formally having been trained in it. For that reason, the Digital Catalyst programme is quite broad.'' »

» Having "scratched the surface last year" with "some positive results", this year he says the company is going to "scale up to the next level", placing 50 students in 50 SMEs and generate some 25 case studies.

One early success has been at machinery maker Hosakawa Micron of Runcorn, Cheshire. The company makes, using standard building blocks, tailor-made powder processing equipment, including metal powder for additive manufacturing purposes, and has made use 3D design for many years.

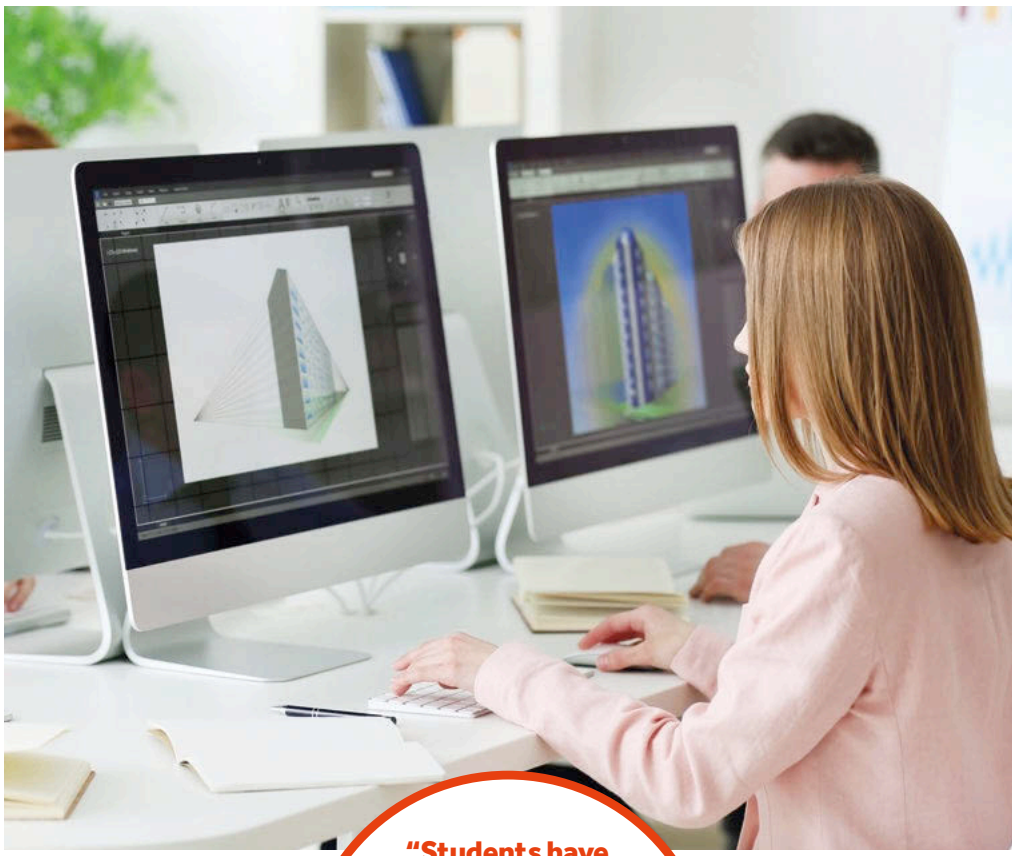
One particular part of the company's business is the design and manufacture of containment equipment to protect operators, keeping people and material apart, with the pharmaceutical industry a key user. These incorporate openings for operators' arms and hands, with protective gloves then providing the barrier and allowing them to interact with physical objects or powders within the containment enclosure.

Iain Crosley, managing director of Hosakawa Micron, explains: "When we are asked to make these, we are usually asked to undertake ergonomic assessments, as people have to be able to reach inside, touch, feel or move things, or look at how something works. We also have to take account of safety and validation, too."

Traditionally, having gained customer approval, a wood and plastic mock-up is built. "Not only is that a slow process, you are also building something that is never going to be used and which will have to be disposed of; not brilliant for the environment," Crosley expands.

The company started to look at virtual reality, but because there was no longer a physical barrier, for ergonomic assessment, a better way was required. "Our idea was to couple the real front of the isolator, the glass panel, the gloves, structure and opening, to a virtual model behind. We also needed to index every movement that is happening in the model. But when we started to look at it, we didn't know where to start."

Hosakawa Micron approached Autodesk and the solution was its VRED, a 3D visualisation software that helps designers and engineers create product presentations, design



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reviews, and virtual prototypes. But the company didn't have the skillset to employ it. However, Autodesk was able to place two digital ambassadors, one located within the company for the best part of a summer, to drive the project on.

The time saving was some four to five weeks out of a 32-week prototype programme, Crossley says, while it is now only necessary to ship the dummy front to customers, rather than a complete enclosure.

Nicole Pellizzon, a second-year aeronautical engineering undergraduate at Imperial College London, is a Digital Ambassador. She got involved with Autodesk last year via a competition involving generative design and is now a Fusion 360 teacher. Via the Digital Catalyst programme, she has been working with UK start-up Etergo based in Holland, which is developing an electric motorscooter. She has been supporting the company from the UK, rather underlining Autodesk's message that includes the potential for distributed collaborative working supported by cloud-based software tools. Says Pellizon: "I am looking at how generative design [within Fusion 360] can be used to lighten components, increasing range per charge." She has some 50 hours' experience with generative design and adds: "It's a very interesting skillset to have. It isn't difficult to physically set up the model, but it is a very different way of thinking. There is almost an advantage as I don't know the traditional way of doing it. Hopefully, when I graduate, generative design will be a highly sought-after skill."

"Students have a mindset that sees them apply design thinking to traditional problems that allows them to shake up the status quo in a positive way."

ASIF MOGHAL

As to how Digital Ambassadors are helping out in the manufacturing end of matters, Moghal says: "There are, in fact, some projects in the pipeline where the Digital Catalysts will be looking at innovation in the machining of parts. However, it's still too early to discuss in the projects more detail."

What seems clear is that Autodesk's revolutionary design and manufacturing tools do require a new perspective from a new generation to kick-start their wider application.

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EMERGING TECHNOLOGIES TAKE POLE

Motorsport has long been at the bleeding edge of innovation and Brent Pittman, director of engineering, automotive and concept design at Autodesk suggests that remains the case.

Motorsport is more than just blazing heat, screeching brakes, a roar of engines, and the test of a driver's skill and bravery. It is positioned as the pinnacle of technological innovation coming out of the automotive industry. But for a sport that uniquely has 'Constructor Championships' to reward the work of the team behind the athlete, it is interesting that the value of new technologies hasn't been realised fully yet. Indeed, when it all boils down, an athlete may be the most talented individual, but it is technology that is the real driver behind the sport's success.

Taking inspiration from the broader automotive manufacturing industry, here are some of the technologies we think have the biggest potential for motorsport manufacturers to revolutionise how their future vehicles will be designed and produced.

Two emerging technologies that are helping to catapult motorsport further into pole position are artificial intelligence (AI) and machine learning (ML). However, they are still very much in the early stages of adoption, with some in motorsport using these technologies to analyse the masses of data collected so that people and processes are better connected, meaning teams can adapt to scenarios almost instinctively. The data allows them to make more accurate, proactive decisions that enhances the performance of the vehicle and delights fans. The focus is largely on the driver, supporting them by using data insights for things like scheduling pit-stops and choosing the exact moment to brake and speed up when navigating corners. With the sheer quantity of data available, motorsport teams have the opportunity to use it in their design and manufacturing processes too, improving performance, handling and the customisation of vehicles, so drivers can feel and respond to the road in unprecedented ways.

Many automotive manufacturers are taking steps toward a more advanced manufacturing environment, one that is characterised by connectivity, driven by data, and open to new collaborative modes of working, something that the motorsport industry needs to catch up on.

What motorsport manufacturers should envision is a converged design and manufacture environment. Product designers should use technology not to document a pre-determined outcome but rather to define the range of possible ideas and narrow them down according to functional parameters.

AI will augment this analysis, learning from each iteration to eventually eliminate the need for engineers to repeat common tasks. As designs move into production, the manufacturing systems themselves will provide suggestions about the impact of specific process adjustments or insight into where failures might occur. Data gleaned from production will be used to enhance simulations of components and systems further upstream in the pipeline, compressing the development cycle.

Generative design tools are being used by automotive engineers to surpass the usual modes and limitations of traditional design thinking. By synthesising forms based on inputs about performance, material or manufacturing characteristics—as opposed to a preconceived idea of how a part should look and behave—generative design can deliver more design options than any team could come up with on its own.

Instead of creating an automotive component based on the previous version of a similar one, engineers tell the generative design tool how strong the part should be, how much it should weigh, how much force it must withstand, and what material it should consist of. Generative design uses AI to rapidly create numerous variants, 'learning' from each iteration.

The potential for these technologies in automotive manufacturing is already being tested, which can act as a major learning curve for motorsport manufacturers. General Motors (GM) is using generative design to promote lightweighting and simplify supply chains to reduce the cost of making electric and autonomous vehicles. In a recent collaboration with Autodesk, GM engineers designed a new, functionally optimised seat bracket. This standard auto part, which secures seat-belt fasteners to seats and seats to floors, typically features a boxy design made up of eight separate pieces. Using generative design software, GM came up with more than 150 alternatives. The one the team chose is made from a single piece of stainless steel and is 40% lighter and 20% stronger than its predecessor. Applying this concept to the motorsport industry across hundreds or thousands of parts can go a long way toward making vehicles less expensive, lighter and more fuel-efficient.

While 3D printed F1 cars may sound farfetched, emerging technologies and environmental requirements may make them a reality. Depending on the vehicle, 3D printing can be used to produce lightweight components, personalised components for mass customisation and on-demand prototypes for generatively designed parts.

Another consideration for investing in new tech is the environmental impact of the sport. Vehicle lightweighting, which can be achieved using additive manufacturing techniques, gives vehicle manufacturers a proven way to improve fuel economy by replacing components with a variety of lightweight materials, including aluminium, magnesium, high-strength steel, plastics, and carbon fibre. Reducing the weight of a vehicle even by 10% typically delivers a 6 to 7% increase in overall fuel economy.

Advanced manufacturing and the adoption of new technologies including AI, ML, generative design and 3D printing within motorsport does not have one set path. Implementations will vary between sports, whether that's F1 or MotoGP, as each organisation chooses investments that will provide the greatest competitive advantage to them. What is clear, however, is that the sport is changing, and it's time to take these technologies for a test drive.

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BRITISH STEEL TO BE BOUGHT BY TURKISH ARMY PENSION FUND

The Turkish Armed Forces Assistance Fund (known as Oyak) has reached a tentative deal to buy British Steel, which employs 5,000 people, out of insolvency by the end of the year.

British Steel owns the Scunthorpe steel works where 3,000 people work with another 800 employed on Teesside. But the firm was put into compulsory liquidation in May after rescue talks with the government broke down.

Another 20,000 jobs in the supply chain were put at risk by the collapse of the talks between the government and British Steel's owner, Greybull, prompting a parliamentary inquiry.

The company was transferred to the Official Receiver because British Steel, its shareholders and the government were not able to, or would not, support the business. The Official Receiver said it had

received "several" bids for the firm, but described Ataer, Oyak's investment arm, as its "preferred buyer".

Ataer owns nearly 50% of Erdemir, Turkey's biggest steel producer, which employs 11,530 people. Together, Ataer-owned companies make about a quarter of Turkey's steel, making it the third-largest producer in Europe, according to the firm's site.

The news was welcomed by UK Steel's, general secretary, Gareth Stace: "British Steel's production facilities in Scunthorpe and the North East represent one third of the UK's steel production and are a major strategic asset to our country."

But he called on the government to partner with the steel industry "to help deliver a level playing field" by subsidising energy prices and lowering business rates.

CUSTOMEM BECOMES PURAFFINITY

A spin-out from Imperial College London, that develops advanced materials for selectively removing target chemical compounds from water, has announced an oversubscribed seed round of £2.8m from leading sustainability investors. In conjunction, it is rebranding and changing its name from 'CustoMem' to 'Puraffinity'.

Puraffinity is currently developing a range of adsorbent media materials, targeted at removing per- and polyfluoroalkyl substances (PFAS) from water.

"By successfully raising seed capital finance, we can accelerate our scale up and deploy our technology in global markets that are in immediate need of a solution to the PFAS problem," said Puraffinity CEO, Henrik Hagemann. "We are pinpointing our efforts at industries facing the most severe contamination problems, such as airports, military bases and chemical manufacturing. This stems in many cases

from extensive use of firefighting foams and the infiltration of these into groundwater sources that now require treatment."

Trials with one of Europe's busiest airports will be commencing in the autumn. In addition, the company is discussing collaborations and partnerships with several companies in the global water space, to accelerate go-to-market plans and meet an ambitious growth agenda.

MATERIALS SOLUTIONS FOR EVS

Universal Science, the thermal management and interface material specialist solutions provider, has signed a channel partnership agreement with 3M to enhance the service, technologies and solutions available in the rapidly growing area of electric vehicle (EV) systems.

3M's Business Development Manager, Reyad Abdulqader, said: "By supporting their efforts with our science and enabling them to utilise 3M materials in a closely-coupled arrangement, we can collectively help drive the proliferation and adoption of environmentally-responsible EVs."

Utilising its niche engineering know-how and 3M materials, Universal Science will work with automotive tier one and tier two companies on thermal management, radio frequency interference, electrical isolation, adhesive, vibration dampening and environmental seals in EV motor & powertrain, battery and sensor applications on future EV platforms. Further applications include human machine interface, car body systems and vehicle glass.

James Stratford, Universal Science's CEO, added: "We can offer a combination of sector engineering expertise, that now uses some of the best and most innovative materials available, to co-develop the optimum solutions to help make the concept vehicles of today reality tomorrow."

NCC SCOOPS TOP AWARD

The National Composites Centre (NCC) has been awarded the Best New Entry from the Royal Society for the Prevention of Accidents (RoSPA), after achieving the Gold award last month when participating for the first time.

The award is the highest accolade in RoSPA's annual Health and Safety Awards, which recognise achievement in health and safety management systems, including leadership and workforce involvement.

The Bristol-based NCC has also been certified to the new occupational health and safety standard ISO45001, which helps organisations to improve employee safety, reduce workplace risks and create better, safer working conditions.

Andrew Hopcraft, COO at the NCC, said: "This is fantastic news for the NCC and a credit to everyone involved. To be recognised so highly by RoSPA and now to achieve the demanding and rigorous ISO45001 standard is a testament to the hard work and dedication of all our people."

METHOD X

by any means necessary

MakerBot has launched Method X, bringing real ABS 3D printing to manufacturing, as well as dimensional accuracy, precision, and reliability at a fraction of industrial 3D printing costs.

MakerBot has announced the launch of Method X, a manufacturing workstation engineered to challenge traditional manufacturing with real ABS (acrylonitrile butadiene styrene) material, a 100°C chamber, and Stratasys SR-30 soluble supports to deliver exceptional dimensional accuracy and precision for complex, durable parts. Method X is capable of printing real ABS that can withstand up to 15°C higher temperatures, is up to 26% more rigid, and up to 12% stronger than modified ABS formulations used on desktop 3D printer competitors. Real ABS parts printed on Method X have no warping or cracking that typically occurs when printing modified ABS on desktop platforms without heated chambers.

Desktop 3D printer manufacturers attempt to get around part deformation that occurs, due to the high shrinkage rate of the material, by using a heated build plate in combination with altered ABS formulations that are easier to print but compromise thermal and mechanical properties. MakerBot Precision ABS has a heat deflection temperature of up to 15°C higher than competitors' ABS, which are modified to make material printable without a heated chamber. With Method X, the 100°C circulating heated chamber significantly reduces part deformation while increasing part durability and surface finish.

The MakerBot Method X combines industry expertise and technologies from Stratasys with MakerBot's accessibility and ease of use to provide professionals with an industrial 3D printer at a disruptive price point.

MakerBot ABS for Method has excellent thermal and mechanical properties similar to ABS materials used for injection moulding applications—making it ideal for a wide range of applications, including end-use parts, manufacturing tools, and functional prototypes. A 100°C Circulating Heated Chamber provides a stable print environment for superior Z-layer bonding—resulting in high-strength parts with superior surface finish. With the MakerBot Method X, engineers can design, test, and produce models and custom end-use parts with durable, production- grade ABS for their manufacturing needs.

Method X is the only 3D printer in its price class that uses SR-30 – enabling unlimited design freedom

Also new is the availability of Stratasys SR-30 material for easy and fast support removal. Method X is the only 3D printer in its price class that uses SR-30—enabling unlimited design freedom and the ability to print unrestricted geometries, such as large overhangs, cavities, and shelled parts. The combination of SR-30 and MakerBot ABS is designed to provide outstanding surface finish and print precision.

"When we initially launched Method, we broke the price-to-performance barrier by delivering a 3D printer that was designed to bridge the technology gap between industrial and desktop 3D printers. This made industrial 3D printing accessible to professionals for the first time. Since then, we have shipped hundreds of printers and received positive feedback from our customers on the precision and reliability of the machine," says Nadav Goshen, CEO, MakerBot. "With Method X, we are taking a step further to revolutionise manufacturing. Method X was created for engineers who need true ABS for production-ready parts that are dimensionally-accurate with no geometric restrictions. Method X delivers industrial-level 3D printing without compromising on ABS

material properties and automation in a new price category."

Engineered as an automated, tinker-free industrial 3D printing system, Method X includes industrial features such as Dry-Sealed Material Bays, Dual Performance Extruders, Soluble Supports, and an Ultra-Rigid Metal Frame. Method X's automation and industrial technologies create a controlled printing environment so professionals can design, test, and iterate faster. The lengthened thermal core in the performance extruders are up to 50% longer than a standard hot end to enable faster extrusion, resulting in up to two times faster print speeds than desktop 3D printers.

These key technologies—combined with MakerBot ABS for Method—are designed to help engineers achieve dimensionally-accurate, production-grade parts at a significantly lower cost than traditional manufacturing processes. Engineers can print repeatable and consistent parts, such as jigs, fixtures, and end-effectors, with a measurable dimensional accuracy of ± 0.2mm.

This announcement from MakerBot comes hot on the heels of its expansion of its materials offering with polyethylene terephthalate glycol, better known as PETG. PETG is the first Specialty Material to be released for the MakerBot Method 3D Printer. Method Specialty Materials are designed to provide advanced material properties for engineers who demand even higher performance.

"PETG is the first in a new line of materials for Method. Our customers have been asking for different materials to use for a wide range of applications that require high strength and durability," said Goshen. "PETG is one of the most widely used polymers today. Because of its advanced properties and versatility, we view PETG as an excellent material to be used on the manufacturing line and for short-run production runs."

Engineers and designers use 3D printable parts made of PETG with speed and agility that can withstand industrial applications, including functional prototypes, jigs and fixtures, and end-use parts.

This industrial-grade material has a heat deflection temperature of up to 70°C and strong layer adhesion designed to reduce shrinkage and warping during printing. PETG is resistant to moisture and many chemicals, including some alkali and acidic substances. It can be used with Method's water-soluble PVA for complex parts and effortless support removal.

PETG has greater strength and flexibility qualities than other materials, such as PLA and ABS, and is odourless when printing. Further, the material prints with a glossy finish and has a good degree of ductility.

Method Specialty Materials are intended for users looking for advanced material properties. They provide basic print performance and can require additional workflow steps to print successfully. PETG requires the application of an adhesion stick to the build plate prior to printing.

MakerBot also has a line of Precision Materials that are the primary materials developed for Method and cover the majority of use cases for prototyping, jigs and fixtures, and end-use parts. These materials have been extensively tested by MakerBot for the highest reliability and measurably accurate parts. These materials currently include MakerBot Tough, MakerBot PLA, and MakerBot PVA.

Seeing the **light**

Henkel and RLE International have demonstrated the sheer lightweighting potential in hybrid automotive body parts.

In a comprehensive joint study, Henkel and RLE International have examined and validated the potential of high-performance structural foam for lightweighting in automotive body and closure parts. The study has revealed that fibre reinforced polymer components with structural foam ribbing and reinforcements can save more than 40 kg of weight per car compared to conventional all-metal designs.

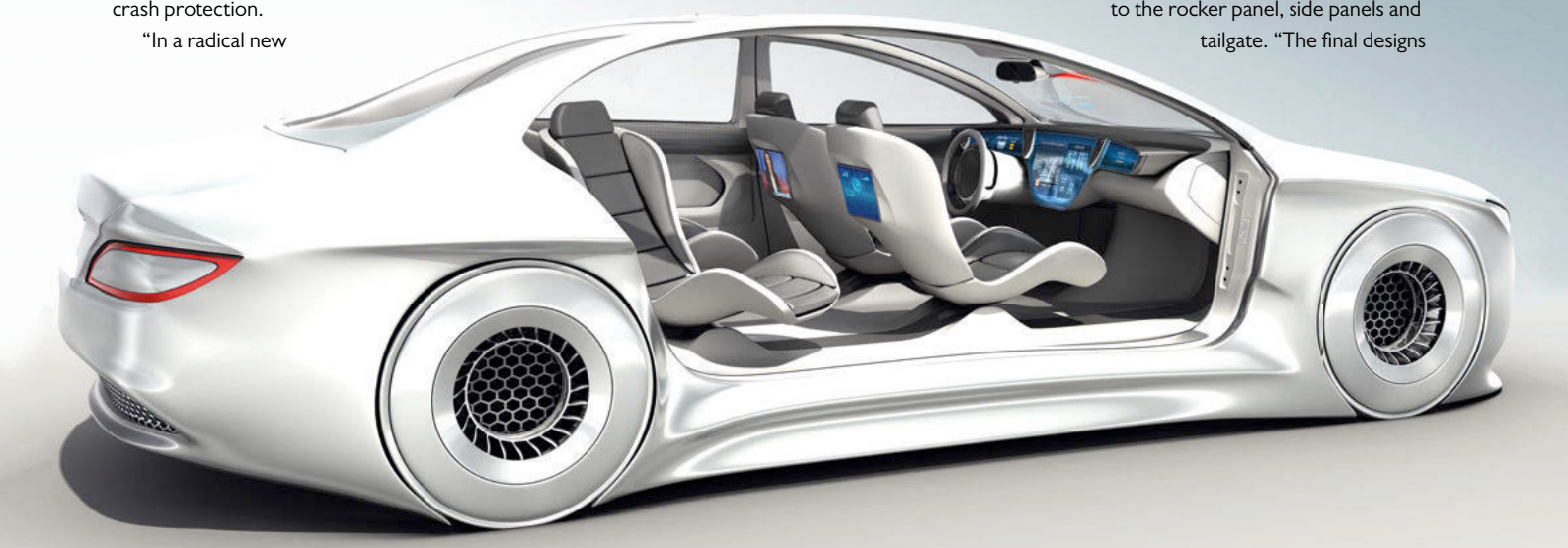
Body components, especially closures, have always been the focus of lightweighting in automotive engineering, since they form some of the biggest parts of vehicles. Even one tenth of a millimetre in thickness can mean several kilos in overall weight, with subsequent effects on fuel or electrical power consumption as well as carbon emissions. In most modern cars, however, the engineering limit on thickness and steel grades are definitely a challenge so further thickness reductions can create problems in meeting the required mechanical strength and crash protection.

"In a radical new approach, we investigated the possibilities of overcoming these constraints by replacing traditional all-metal designs with hybrid fibre and structural foam reinforced polymer solutions," says David Caro, head of global engineering, OEM design, automotive & transportation at Henkel. "The results of our study have confirmed that we can achieve significant further weight reductions without compromising the safety in typical crash scenarios by optimising the stiffness of fibre reinforced plastic frames or carriers with selective foam ribbing and reinforcements, with competitive costs."

The hybrid parts feature a solid frame or carrier moulded in higher percentage fibre reinforced polymers (FRP) and selective reinforcements using Henkel's Teroson EP structural foam, a commercially available epoxy-based material that delivers high strength and stiffness at extremely low weight. The foam is injected into the carrier at predefined sections, expands in the e-coat oven and creates a stiff connection between the hybrid component and adjacent parts in the body-in-white.

Non-cured, it is resistant to normal automotive washing and phosphating solutions as well as to electro-dip coating. Curing then takes place within 15 minutes or less, depending on the specific foam grade.

The comprehensive project included all major body and closure parts of an SUV vehicle, from the bumpers, fenders, pillars and doors to the rocker panel, side panels and tailgate. "The final designs



Hot form quench sets aluminium lightweighting standard

Impression Technologies has released a white paper introducing the benefits of its ground-breaking new technology: hot form quench (HFQ). An innovative hot forming process was developed to offer a step change in aluminium forming across multiple industries, including automotive and aerospace.

The drive to reduce emissions and improve efficiency through lightweighting constantly requires manufacturers to find new solutions. The white paper, titled 'Hot Form Quench (HFQ) Technology: The new international standard for cost-effective automotive lightweighting using aluminium', outlines how manufacturers can easily and cost-effectively replace steel or low-gauge aluminium components using HFQ. The process cycle time for HFQ is at least as rapid as alternatives such as boron steel processing, enabling the low-cost, high-volume manufacturing demanded in automotive applications.

The white paper describes the benefits and process of HFQ in detail. It also includes examples and case studies that illustrate how the technology can be applied and what can be achieved: a measurably stronger final component, alongside major savings in weight and cost when compared with alternatives.

"The automotive industry is on a constant mission to improve structural strength, integrity, consistency, durability and safety, all while reducing weight and cost," explained Jonathan Watkins, CEO of Impression Technologies. "This is a very challenging set of goals that requires constant evolution and quick uptake of new technologies and processes.

"HFQ is a unique, patented process that enables low-cost production of high-strength aluminium parts. The benefits of aluminium in automotive applications are widely known, but there have been concerns around cost, strength and production rate. HFQ addresses these."

The crash simulations performed in the study strictly adhered to demanding international automotive standards

were arrived at in several consecutive optimisation cycles based on extensive finite-element engineering and crash simulations in line with standard specifications," explains Tobias Wigand, project manager, new business development, RLE International. "In some cases, such as the side doors, our hybrid structural plastic and foam solution was even capable of exceeding the expected performance when compared with the initial all-aluminium design."

The crash simulations performed in the study strictly adhered to demanding international automotive standards, such as offset and small overlap frontal crash testing according to the European New Car Assessment Programme (Euro NCAP) and the Insurance Institute of Highway Safety (IIHS) at speeds of 64 and 50 km/h, respectively. The side (or "pole") crash performance was tested according to U.S. NCAP specifications at 32 km/h. The rear impact scenario was simulated with a 60 km/h moving barrier onto a fixed test vehicle as defined by U.S. Federal Motor Vehicle Safety Standard (FMVSS) No. 301. Another IIHS test standard was applied to establish the roof crush behaviour.

Altogether, the hybrid designs with Henkel's Teroson EP structural foam were found to pass all these tests well within the limits of deformation and intrusion, while offering substantial weight savings compared to conventional all-metal components. Henkel and RLE International are offering their hybrid structural design technology as an encompassing joint approach from concept to launch and series production, ensuring the process security and sustainability of all development, engineering and material processes. Each design is fully engineered and optimised for all pertinent crash load cases according to customer specifications and applicable industry standards.

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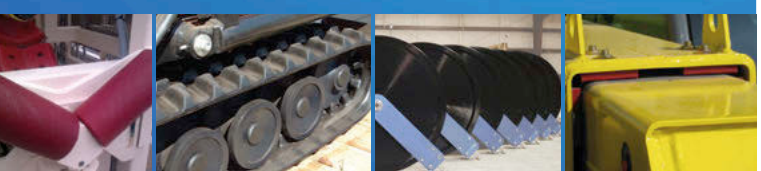

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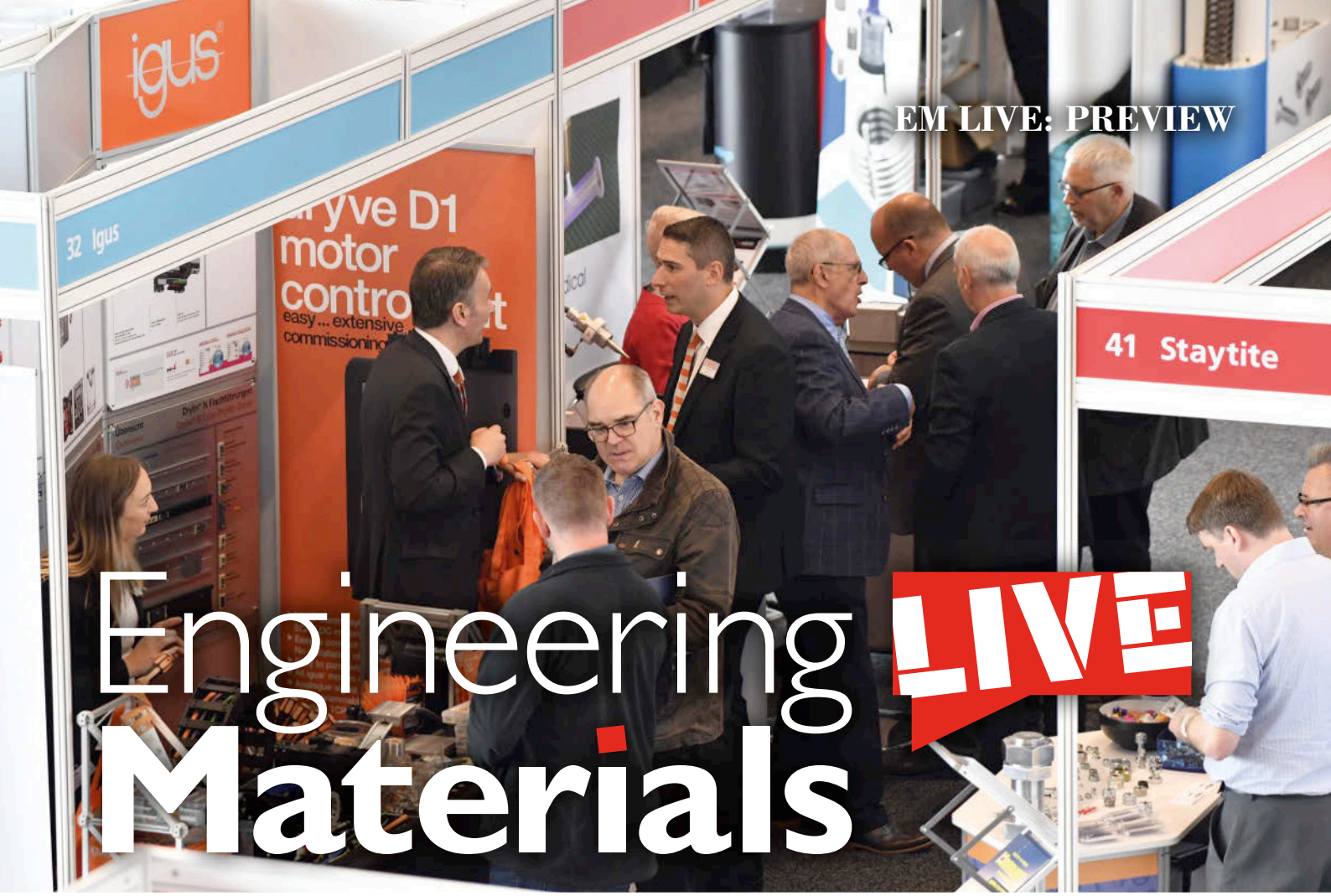

Engineering Materials LIVE

TOO GOOD TO MISS!

Featuring top-level suppliers providing cutting-edge design and engineering solutions, Engineering Materials Live promises to make a visit more than worthwhile.

The Engineering Materials Live Exhibition takes place on Thursday 19 September at The National Conference Centre, Solihull and it promises to offer huge value to visitors.

Engineering Materials Live is a specialist UK exhibition meeting the needs of engineers tasked with sourcing and specifying plastic mouldings, composites, prototyped parts and advanced engineering materials - and it is all FREE to attend!

Selecting the right material for the right application is crucial to the success of any design project, which means working with suppliers that have the materials expertise and application knowledge - this is why Engineering Materials Live was created.

Looking to replace traditional materials for lighter, cheaper and smaller alternatives? Want to improve surface preparation processes for better adhesion? Then come and meet the high-quality exhibitor portfolio, which includes some of the UK's leading suppliers in plastics, materials forming, advanced composites, lightweighting and rapid prototyping, and find the solutions.

Co-located with FAST Live – the UK's only specialist fastening, bonding and assembly exhibition for design engineers, production professionals, manufacturers and fastener buyers – the event also includes CPD-accredited technical seminars offering detailed insight into some of the material and joining solutions available. The following provides just a small taste of what exhibitors will have on show.

- **VON ROLL**, a global market leader for products and systems for the electrical power generation, power transmission sector and the only company to offer the complete range of insulation products,

composites, wires, resins, consulting, tests and services for the electrotechnical industry. Focusing on composites and ballistics, Von Roll provides a comprehensive spectrum of semi-finished and machined laminated products, from mica, glass, synthetic fibres, natural reinforcement materials, polyester to high temperature-resistant resin systems, many combinations are possible.

■ **PRECISION MICRO** is a specialist in etching both titanium and aluminium, metals with favourable properties but which are challenging to machine with traditional sheet metalworking - such as stamping and laser cutting - and indeed etching.

For designers looking to manufacture burr- and stress-free metal parts with complex geometries, maintain the flexibility to make last-minute design changes and mass-produce prototypes quickly, photo chemical etching is the answer.

But there is another key advantage of etching, and that is the fact that through constant investment in R&D, leading practitioners like Precision Micro can apply the process to almost any metal – even those notoriously difficult to machine.

Its propriety processes are offered with all of the existing benefits of chemical etching, and at lead times measured in days, not months.

■ **K.D. FEDDERSEN** will also be exhibiting. The company recently made a significant contribution to the development of a composite C-Pillar reinforcement component, designed by Engenuity Ltd (ENG) and manufactured by Surface Generation Ltd (SG). This exploits the principle of thermoplastic overmoulding to achieve a step change in structural performance of the vehicle body-in-white (BIW). That is, to make judicious use of high performance, aligned, continuous fibre reinforced material only in localised areas where load paths demand their use, thus minimising the overall part cost. Elsewhere, more affordable short fibre reinforced material is used to realise complex features that add part stiffness through geometry and enable assembly.

The component possesses complex geometry and variable thickness (2mm to 8mm). It comprises four inserts of continuous fibre (CF) reinforced PA6 (SGL Group, Sigrafil C T50) overmoulded with a short fibre (SF) reinforced PA6 compound (K.D. Feddersen, AKROLOY PA ICF 40). The component is adhesively bonded to the BIW after its e-coat process. The CF inserts are stamp formed from a pre-consolidated organosheet produced with a highly orthotropic laminate stacking sequence to suit the in-service loading of the component.

The moulding surfaces of the forming tools are adjusted, using output from analytical studies conducted by SG, to compensate for process induced distortion. The CF inserts are positioned in the overmoulding tool. The tooling is designed and manufactured by SG and incorporates their patented “PtFS” thermal control technology. The tooling is closed and each of the 96 heater/cooler channels are zoned and their thermal cycle optimised. The component is cooled partly in mould and partly within an external fixture. SG and ENG worked together to develop test methods that would enable the optimum process conditions to be established in relation to the bond strength between the overmoulding material and the continuous fibre reinforced inserts. PtFS technology was exploited to achieve the necessary thermal conditions prior to overmoulding.

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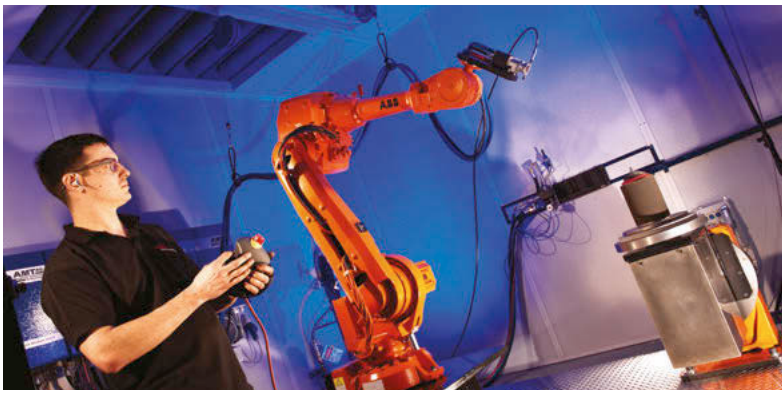

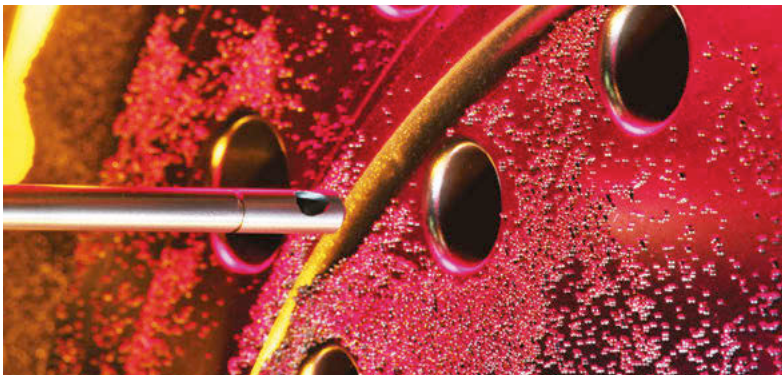

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WORKING IN HARMONY

To ensure the stability and safety of drive assemblies, OEMs and machine builders must ensure drives comply with specific EMC requirements.

In many industrial environments, ensuring the stability of drive controllers is sometimes overlooked. However, according to Mark Checkley, sales and managing manager, KEB Automation, an EMC-compliant (electromagnetic compatibility) drive assembly with efficient control cabinet and suppression system is the basis for ensuring the safe and reliable operation of machines and equipment. It can also extend the life of certain components.

The operation of variable speed drives with intermediate voltage circuits can put stress on the mains and motor, which can be optimised using additional measures

Manufacturers and operators are required to implement the installed drive systems to achieve electrical compliance with the limits – for emissions – and requirements – for fault-free operation – set out in the relevant European and International standards and regulations. Utilising some components can lead to additional advantages besides compliance.

For power drive systems (i.e. inverter and motor viewed in terms of a drive), the product standard is EN 61800-x, with EN 61800-3 being the relevant EMC standard. The technical standard sets out the requirements for a specific environment. EN61000-6-x applies to machine builders and sets out the general EMC requirements for use either in a public low-voltage grid or an industrial grid/network.

''When selecting a drive,'' Checkley explains. ''It is sensible to check what range of accessories the drives supplier can offer. Whilst some of these accessories can be sourced from other Third Party suppliers, it is often better to deal with a supplier that can provide everything from a single source, so the items are optimised to suit their own specific drives (or even designed in-house for their drives) and therefore more likely to meet the specific requirements of your application.''

He adds, the operation of variable speed drives with intermediate voltage circuits can put stress on the mains and motor, which can be optimised using additional measures, depending on the place of use and the type of application. An EMC-compliant drives assembly may therefore include several accessories and interference suppression components for the mains- and motor-related optimisation of operating conditions. The most common suppression components and their functions are:

MAINS SUPPRESSION

''Mains chokes optimise the harmonics to the mains power supply that »

» result from the pulse-shaped charging of uncontrolled rectifiers and reduce the effective input current,'' says Checkley. ''This decrease in stress has the direct effect of significantly increasing the service life of the link voltage capacitors in inverters and servo drives, as well as reducing the stress on the input rectifier.

''By smoothing the input current draw, the lifetime of the drive and its components are enhanced, particularly at constant high utilisation. For mains chokes, it is also important to ensure sufficient installation space to consider the higher heat emissions and a strong magnetic field.''

Checkley adds that mains EMC/Harmonics filters reduce the cable-fed emission to the required limits of IEC 61800-3-C1/C2 and reduce the low frequency mains distortion on rectifier supplied devices by a further 8 to 15%. They are also said to allow easy integration into a switchgear layout. Other variants may offer low leakage currents or the operation of special mains networks.

MOTOR-SIDE ACCESSORIES

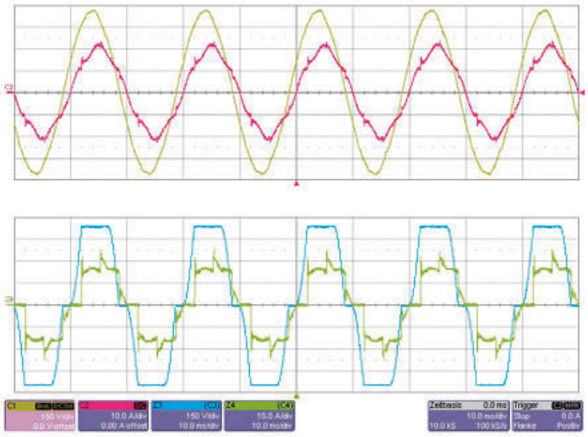
Motor chokes provide a cost-effective option for reducing the voltage rise rate (dv/dt) in order to avoid the premature ageing of the coil insulation in AC motors, particularly on high speed applications. These chokes increase total inductance at output and reduce current ripples. They also reduce the peak value of the current and the stress on IGBTs in inverters. Motor chokes are also suitable for applications with long motor cables (>15m and up to 50m).

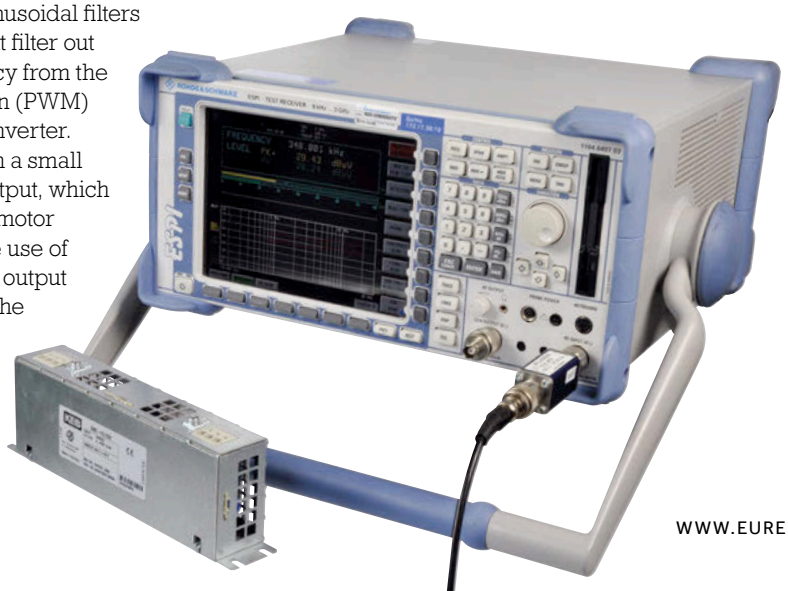
Checkley says: ''Sinusoidal filters are low-pass filters that filter out the switching frequency from the pulse width modulation (PWM) – output signal of the inverter. Sinusoidal voltage with a small ripple occurs at the output, which results in a sinusoidal motor current. Therefore, the use of sinusoidal filters at the output is not associated with the supplementary losses in the motor's stator and rotor, which otherwise occur with inverter use.''

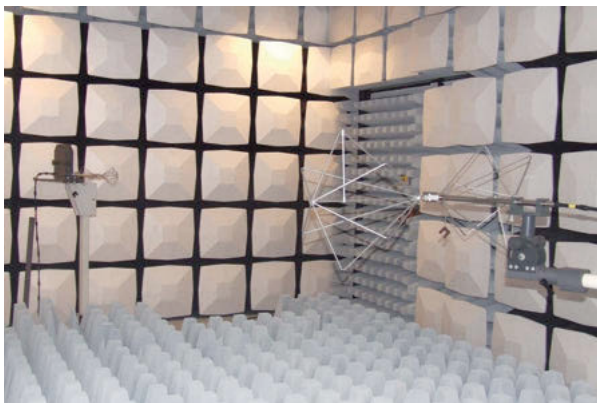
Other motor-side accessories include sine-wave filters that protect the motor winding from voltage peaks and allow the use of long motor cables; sine-wave EMC filters allow operation of motors with long motor cables – thousands of metres – without shielding (although at these lengths it can create other issues to be aware of); and high performance ferrite cores that reduce the values of dv/dt's also in the frequency range of the bearing currents.

MAINS-MOTOR COMBINATIONS

Some drives suppliers offer combinations of mains-side and motor-side accessories that can be more closely tailored to suit the specific needs of the machine or robot. Combi-filters (EMC/output choke), for example, are space-saving combinations that provide the advantages of both, with the addition of reduced wiring, as well as consistently adapting and optimising the drive controller. Typical combinations include:







NHF-filters which combine a mains choke and HF filter in a single, compact enclosure. This means that the filter combines the advantages of the mains choke with those of the HF filter. These combinations often result in high saturation resistance and small leakage currents, mechanically designed as ancillary filters.

I/O-filters integrate the functionality of the mains-side HF filter and the motor-side dv/dt filter in one compact enclosure. A portion of the input filter that is configured with high damping at minimal leakage current, reduces conducted interference to limit value in compliance with EN 61800-3. These can be incorporated inside some drives, saving space, plus low leakage versions are also available when the application requires this.

EMC ADVICE AND COMPLIANCE TESTING

''EC Directive 2004/108/EC requires all equipment manufacturers to design the installation of electrical systems in compliance with EMC legislation,'' Checkley says. ''In many cases, this means that individual CE-labelled components must be inspected for their interaction with the equipment or machine.

''It is wise to check not only if the drives supplier can offer mains- and motor-side accessories, but also whether they can provide comprehensive EMC advice, electrical testing services and on-site assistance when required. This will ensure you eliminate any expensive investments in measurement devices and training in complex standards, as well as ensuring that you have the necessary support during your development phase.''

EDS 2019: INNOVATI

Taking place in October, EDS 2019 will introduce many new and exciting factors, but the fundamental focus on engineering design remains the same.

200 EXHIBITORS

27+ CONFERENCES

33+ WORKSHOPS

More than 4,000 visitors are expected to attend this year's Engineering Design Show, which takes place at the Ericsson Exhibition Hall, Ricoh Arena, Coventry on the 16th and 17th October.

As ever, they will be drawn to the event by its unique focus on design engineers and what they need. This is because The Engineering Design Show is the UK's only event entirely dedicated to engineering, electronics and embedded design. The show provides the ideal environment for design engineers to benefit from direct access to the latest products, services and innovations available to the sector.

Now in its eighth year, the show is able to achieve this because of the sheer level and variety of content it provides. This comes not only in the form of the more than 200 exhibitors, but also in the top-level conference programme, which will see 27 speakers from across industry and academia addressing key topics and technologies. In addition, there will be a programme of 33 practical workshops on the exhibition floor offering hands-on, practical advice on everyday design issues.

But while it has been consistent in delivering high-quality content since its launch in 2012, the Engineering Design Show has never stood still, continuing to innovate and provide something new every year.

In 2018 that innovation came in the form of EDS TV, an exciting way for exhibitors to get your brand noticed at the UK's leading engineering, electronics and embedded design event. EDS TV delivers an up to the minute experience by creating a live content channel online and at the venue. It's the ultimate way to increase show buzz, enhance engagement with visitors and reach a much wider audience. It will be back at the 2019 show.

This year, there is a new way to interact with the show's content by using the new Augmented Reality function. The Engineering Design Show strives to bring you advanced technologies and provide design engineers direct access to the latest products, services and innovations.

The digital content will enable you to review the best bits of the 2018 show and take a look forward to some of the exciting new features planned for 2019. The app promises an immersive and interactive experience, as well as a bit of fun, and we'd love to get your feedback on it. Simply download the free REYDAR app and scan page 44 in this issue of Eureka! to launch the content and find out more about EDS 2019.

In addition, the new Robotics Innovation Hub will showcase the very latest in robotics design and technology from award-winning companies and innovative start-ups.

This interactive space will include demonstrations of robotics from Applied Automation and MakerBot plus many more.

The Future Zone is also returning for 2019. Visitors will be able to discover how the latest VR technology from RiVR is changing the way humans learn and try it for themselves. RiVR can capture any location and recreate it in photorealistic virtual reality, allowing users to interact with and experience these worlds, enhancing the way humans learn.

In addition to the feature stands, the organisers are introducing an easy to use one-to-one meeting tool. Visitors, exhibitors and speakers will be able to pre-book meetings

ON DRIVES GROWTH

with key contacts at convenient times. The meetings tool is fully searchable by company as well as area of interest and allows users to maximise time at the show and increase their return on investment by ensuring their diary is full of meetings before they even step foot on the Engineering Design Show floor.

The EDS conference will once again offer 24 keynote presentations brought together by the editors of New Electronics and Eureka! magazines, offering insight and debate. Highlights for 2019 include Sandvik, HP, Automata, ByteSnap Design, Cambridge Consultants and EnOcean. Subjects being covered will include Designing the Unbreakable Guitar, Robotics, Gamification, PCB Design, 3D Printing, Electric Vehicles plus much more.

One of the highlights of the Conference programme will be the presentation 'The Interacting Elements of Innovation Culture' by Ben Watson, Innovation Leader at 3M. Developing the cultural drivers for innovation to thrive and to balance innovation outcomes over time can be a challenge. 3M famously maintains and invests in several key elements to maintain this balance from sustaining core business to breakthrough innovation through its innovation culture.

This presentation will look at how to define and better understand the cultural drivers and the necessary innovation management principles, with relevance for your own organisation.

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EDS MEETING TOOL

Visitors, exhibitors and speakers have access to the new meetings tool, which enables everyone to pre-book meetings with key contacts at convenient times.

The meetings tool is fully searchable by company and area of interest, allowing users to maximise their time at the show.

Ensure your diary is full of meetings before the show opens.

ROBOTICS INNOVATION HUB

Robotics technology is advancing rapidly, and the new Robotics Innovation Hub will showcase the very latest in robotics design and technology from award-winning companies and innovative start-ups. This interactive space will include demonstrations of robotics from Applied Automation, Comau and MakerBot.

FUTURE ZONE

Visitors will be able to discover how the latest VR technology from RiVR is changing the way humans learn and try it for themselves. RiVR can capture any location and recreate it in photorealistic virtual reality, allowing users to interact with and experience these worlds, enhancing the way humans learn.

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A DECADE OF EXCELLENCE

10TH ANNIVERSARY

beea

The British Engineering Excellence Awards were launched in 2009 to champion and celebrate design innovation and excellence. Since then, the BEEAs has grown in stature as has the number of companies entering to win the foremost engineering accolade for design.

The BEEAs has been highlighting the breadth and depth of the UK's design engineering community and how it is competing on a global stage for the last 10 years. Winners of the Grand Prix, the best-of-the-best of each year, have ranged from individual engineers doing outstanding work both in their industries and communities, to small companies with staff numbers in the single-digits, to larger OEMs.

Each year, hundreds of entries are debated and analysed by a judging panel of industry experts, which includes the winners of the previous year's Grand Prix and Design Engineer of the Year Awards.

Cambridge Consultants has been a headline sponsor of the event since 2009. Its CEO, Eric Wilkinson says: ''Cambridge Consultants has supported the BEEAs right from their inception, because we believed that the quality of depth of engineering talent here in Britain needed to be highlighted and celebrated. The BEEAs do more than give engineers a lift for a day – they inform and inspire fellow engineers, entrepreneurs, investors and, perhaps most importantly, graduates and students to be proud of what they are part of and to give free rein to their ambition.''

The ninth British Engineering Excellence Awards ceremony took place at a gala luncheon on 5th October 2017 at The Honourable Artillery Club, London.

2017 WINNERS

10TH ANNIVERSARY

GRAND PRIX
Sponsored by: Mark Allen Business
Winner: **Plessey Semiconductors**

CONSULTANCY OF THE YEAR
Sponsored by: Rutland Plastics
Winner: **Drive System Design**
Highly Commended: **Penso Group**

SMALL COMPANY OF THE YEAR
Sponsored by: IG Motion
Winner: **Diamond Hard Surfaces**
Highly Commended: **Emblation**

START UP OF THE YEAR
Sponsored by: Cambridge Consultants
Winner: **Open Bionics**

DESIGN TEAM OF THE YEAR
Sponsored by: Altium UK Limited
Winner: **Kliklok ITC Project**
Highly Commended: **PRaVDA/University of Lincoln**

MATERIALS APPLICATION OF THE YEAR
Sponsored by: Goodfellow
Winner: **Plessey Semiconductors**

NEW PRODUCT OF THE YEAR (ELECTRONIC)
Sponsored by: New Electronics
Winner: **Peratech QTC Matrix Sensor**

NEW PRODUCT OF THE YEAR (MECHANICAL)
Sponsored by: Eureka!
Winner: **Aeristech Scharger**

NEW PRODUCT OF THE YEAR (AEROSPACE)
Sponsored by: Minitec
Winner: **Smith Myers Artemis**

ENGINEERING AMBASSADOR OF THE YEAR
Sponsored by: John Guest
Winner: **Julia Motoc**
Highly Commended: **TDK-Lambda UK**

YOUNG DESIGN ENGINEER OF THE YEAR
Sponsored by: RS Components
Winner: **Rob Hanson, Designability**

DESIGN ENGINEER OF THE YEAR
Sponsored by: Maxon Motor
Winner: **Jake Wallis, Lontra**

WHERE ARE THEY NOW?

Graduate engineers represent a significant part of the future for UK industry. As employers look to refresh product lines and address new markets, young engineers can make an impact by bringing fresh approaches and thinking.

Winner of Young Design Engineer of the Year, Rob Hanson [pictured] graduated from the University of Glasgow with an MEng in Product Design Engineering in 2013 and, in the words of his employer, Designability, he hasn't looked back. National charity and advocate of 'better technology for everyone', Designability works with end-users, carers and health professionals to understand problems, find solutions and test them in real life situations.

Hanson's work has included the design of a wheelchair baby carrier, dynamic seating for young children

Above: The winners of the 2017 BEEAs.

Inset: Dan Hanson, winner of Young Design Engineer of the Year 2017.

with dystonic cerebral palsy, and the development of Wizzybug, a powered wheelchair for children younger than five years old.

Hanson also played an important part in Designability's 'Design Together, Live Better' project, in which it works with the public to understand the challenges of living with disability and to design products which overcome these problems.

In one of these focus groups, Hanson heard from a young mother who had a stroke which left her weak on one side. Her wish was to be able to place her two young children in their car seats and to fasten their seat belts. His solution was a unique mechanism that allowed seat belts to be fastened with one hand.

Alongside these projects, Hanson has worked with students at Bath College, to develop products that solve real life challenges, including using a guide dog, deafness, and cycling with osteoarthritis. Following this course, three of the seven students began engineering and design related degrees. He has also been involved in the Smallpeice biomedical engineering summer course at Southampton University, aimed at 16- to 18-year olds, delivering a 'design and make' course targeted at products for people with a disability.

The UK still faces an engineering skills crisis, with the number of people leaving the profession exceeds the number preparing to follow a career in engineering.

Around the country, companies are working with local schools to promote engineering, by sponsoring them to enter STEM related competitions or by providing work experience opportunities.

Iulia Motoc, who won Engineering Ambassador of the Year, has been involved in more than 30 local and national outreach activities. She was an Academic Ambassador and STEM Ambassador for the University of Kent and was appointed an Ambassador for the Queen Elizabeth Prize for Engineering, in 2017.

Amongst the activities in which she has been involved are judging the First Lego League, presenting at the Big Bang Fair, participating in 'I'm an engineer; get me out of here!' and helping to prepare schools for the Primary Engineer Leaders Awards. Alongside these, Motoc has been involved with summer schools and science extravaganzas.

As if that weren't enough, she has been doing outreach work at an international level through the IEEE and was part of the organising committee for the 2016 Teacher In Service Program week, which saw more than 600 teachers from 15 countries being trained to deliver hands on activities in the classroom.

Motoc's ambassadorial activities took place alongside work on a PhD based on robotics at the University of Kent, including developing grasping and walking algorithms for bipedal robots. She is now a research associate at the University.

We will be covering the 2018 Awards in the October issue. Entries for the '10th anniversary' awards have now closed, and judging will take place shortly, so why not visit www.beeas.co.uk to have a look at the shortlist including the Design Engineer of the Decade category.

BRINGING DOWN THE CURTAIN... SAFELY

Warner Electric has developed a contactless sensor to provide improved monitoring of electromagnetic brakes for elevator, and stage and theatre applications.

Electromagnetic brakes have become a popular option for elevators, as well as for lifts and winches in stage and theatre applications. (Image Source: AdobeStock - epitavi)

Backwards compatible with conventional electromechanical microswitches, but with none of their inherent limitations, Warner Electric's WES contactless sensor is claimed to bring improved reliability to electromagnetic brake monitoring, and adds the capability for predictive maintenance, eliminating unscheduled downtime.

Electromagnetic brakes have become a popular option for elevators, as well as lifts and winches in stage and theatre applications. The design of brakes for such applications is covered under the European standards EN81-20:2014 and EN81-50:2014 and the US standard ASME A17.1, which specify that proximity sensors must be incorporated into the brakes to provide verification that the brake has engaged or disengaged.

Traditionally this function has been achieved using snap action, dry contact microswitches, which are popular due to their simple mechanical architecture and compatibility with different current and voltage requirements.

But the prevalence of PLC control in modern applications means current and voltage handling is of minimal advantage, while mechanical failure due to vibration and from the non-conductive contamination oxide layer that tends to form on the gold alloy contacts in lower voltage applications, increases the servicing requirements on the brakes. There are also environmental concerns about pollution from the silicon in the contact alloy. Further, while the hysteresis cycle is typically around 0.05mm, the susceptibility to mechanical vibration and pollution means the stroke must be increased to provide a greater 'displacement margin' around the hysteresis points which increase over time and to prevent drift of switch point.

Inductive switches address many of these issues, providing non-contact operation that is free from wear, and being insensitive to vibration, dust and moisture. But temperature range is limited, and the switching point can drift with temperature. Further, strong magnetic fields can saturate the core of the sensor, altering the switch point or creating uncontrolled switching of the sensor. Finally, while the solid-state output is fully compatible with modern PLC control systems, there is no backwards compatibility with the simple NO/NC dry contact switch-based systems that are prevalent within the elevator industry.

The WES contactless sensor brings improved reliability to electromagnetic brake monitoring, and adds the capability for predictive maintenance, eliminating unscheduled downtime.

To address these issues, the sensors offer reliable, wear-free, shielded detection of brake engagement/disengagement. Fully compatible with the EU and US standards, they give an accurate and repeatable switching point combined with hysteresis of 0.03mm over a temperature range from -40°C to 105°C. This means sensing distance is no longer a constraint in brake design, enabling the brake air gap to be reduced to as little as 0.15mm, giving increased braking torque.

Three output options are available, including an NC/NO output that is backwards compatible with existing dry contact switching circuits used with traditional microswitches. The sensors also provide NPN or solid-state outputs compatible with PLC interfaces, along with an analogue output that provides a voltage proportional to absolute stroke/air gap position. This enables wear to be monitored as part of a predictive maintenance strategy.

KEEP ON ROLLING

The term 'Smart Products' has become part of everyday vocabulary as we acquire ever-increasing numbers of devices that communicate with each other and allow us to control them or access information we need at any time.

The industrial world is becoming increasingly interconnected through the Industrial Internet of Things (IIoT) enabling sensors, instruments and other intelligent devices used within a manufacturing environment to gather, exchange, evaluate and store data. This connectivity, and the data produced, can be used in a multitude of ways to improve productivity and process efficiency.

Swiss automation solutions company, Güdel has introduced Condition Monitoring package for its IIoT based products and tools, such as linear guideways, racks, pinions and drives right through to linear axes and gantry robots, enabling users to perform condition-based maintenance.

Güdel components and modules are used within industry segments where high levels of efficiency and productivity are essential. A key element in attaining these objectives is the ability to reduce downtime.

Although only a small part of the linear tracks, robots, gantry systems and linear axes manufactured by the company, rollers play a significant part in the operation and reliability of these systems. Understanding the condition of the rollers is important if ongoing and trouble-free operation is to be achieved, and Güdel's Condition Monitoring package provides users with the data they need to predict potential component failure before it becomes a critical issue.

The technology is based upon the detection of vibration using accelerometers, a proven method to monitor the condition of ball bearings. The critical parts of a rolling bearing are those surfaces that run on each other. These are the rolling element surface, the running surface of the inner ring and the running surface of the outer ring.

Should the running surfaces be damaged locally, a shock pulse occurs when the damaged area rolls over. This characteristic can be picked up by an accelerometer and the greater the damage, the stronger the shock pulse. In addition, as the speed of the roller is known, it is possible to determine whether the inner ring, outer ring or rolling element is defective.

The data collected from the sensors is stored on a local condition-monitoring computer, supplied as part of the package. No network connection is required and Güdel' Condition Manager software allows users to manage the system. Options are available if required, should users wish to connect the system to a local network or the wider web and enable e-mail alerts etc. if the system detects a significant change in the pulses being picked up by the sensors.

The functionality of the system includes e-mail alerts if threshold values are exceeded, visualisation of historical trend data from all the evaluation units, automatic storage of trend data in a local database, alarm history and documentation of maintenance work carried out. The system can also be expanded if required to meet future needs.

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HR IS CRUCIAL TO EFFICIENCY DRIVE

Leading manufacturers understand the importance of lean production – yet many have not fully realised the potential of HR teams to deliver better ROI.

According to Adam Barrett, manufacturing HR technology specialist at the Access Group, industries such as engineering, pharmaceuticals and food and drink are counting the cost of low workforce engagement, high staff turnover and uninformed decision-making.

Writing in a free two-part guide, he reveals that a third of HR practitioners currently lose more than two working days every week due to poor collaboration between different teams and reveals how the 1% marginal gains theory used by top sporting coaches can be used to tackle some of the core issues in manufacturing HR departments.

The same theory was famously used by British Cycling in 2002 after years of limited success. Six years later, the team had seven Olympic gold medals under its belt, matching that haul at the 2012 Olympics and going on to win seven Tour De France titles.

Commenting on the findings, Barrett says: "Improving by 1% isn't particularly noticeable on its own but over time, it can lead to results that are far more impressive and sustainable. Think slow burn, not big bang."

One of the biggest challenges facing manufacturing is labour shortages but even those who manage to recruit must work hard to retain staff. Engaging a workforce made up of permanent and seasonal staff, some of whom will be on low wages and working shifts, can be tricky.

Barrett adds: "The uncertainty around Brexit has added a new dimension to the problem, with some firms concerned that they won't be able to fill roles without a supply of EU labour, whether because of immigration restrictions or because people choose not to come to the UK.

"Despite this, there are many manufacturing firms currently flying the flag for HR excellence, with the likes of Paxton launching its own learning portal for both work and non-work-related development and ready meal manufacturer COOK and its peer-to-peer nominee rewards scheme. Achieving best practice like this is an ongoing process, which involves developing clear and consistent processes, data-led decision-making and collaboration across departments."

Contrary to widespread perceptions, according to Barrett, UK manufacturing is thriving, with the UK currently the eighth largest industrial nation. If current trends continue the UK will break into the top five by 2021. As the industry continues to grow, HR will have an increasingly important role to play.

"While some senior managers evidently already understand that empowering HR to make better use of people, data is key to addressing these issues, they do not necessarily know where to start," says Barrett.

"Wholesale change is always daunting – not least because it tends to require significant investment and buy-in – so these books highlight the benefit of small but continuous improvements. Something as simple as reviewing the way that skills checks are conducted or implementing a company-wide employee engagement survey can have a substantial impact."

The first book, 'Small HR Innovations that Make a Big Difference: The 1% Rule', is a look at the latest industry thinking, while the second, 'Driving Change in HR: Applying Marginal Gains in 2019', provides practical advice on how HR can deliver on wider business objectives. Both are available on the Access group's website.

Small HR Innovations Guide is:
www.theaccessgroup.com/eureka

Small HR Innovations Manufacturing Guide is:
www.theaccessgroup.com/eurekaguide

10TH ANNIVERSARY

beea

british engineering excellence awards

Celebrating

A DECADE OF EXCELLENCE

Join the UK's leading design engineers and tomorrow's rising stars as we unveil the winners of the 2019 British Engineering Excellence Awards

Where
The Landmark London

When
11th October 2019, 11.30am

What
Drinks reception followed by a 3-course lunch

Host
Dr Lucy Rogers, science author, inventor, and a judge on the BBC2 show Robot Wars.

Book your seat now and join us as we celebrate British innovation and engineering at its very best

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WASTE NOT, WANT NOT

That funny smell emerging from your fridge because there's something tucked away there that's been forgotten about for far, far too long is a familiar scenario for most of us. And all of us must have reached into the ironically-named 'salad crisper' only to discover that, far from being crisp, that lettuce we so fancied a few weeks ago has deliquesced into an alarming green porridge.

Taken as a whole, food wastage is a very serious problem. One-third of the food produced in the world for human consumption gets lost or wasted every year, according to the UN's Food and Agriculture Organization. That's a staggering 1.3 billion tonnes. To put that in context, every year, consumers in the world's richest countries waste almost as much food (222 million tonnes) as the entire net food production of sub-Saharan Africa (230 million tonnes).

THE CHALLENGE

This month's Coffee Time Challenge is to avoid waste by finding a means of letting you know the condition of the food in your fridge without having to inspect it all. The important thing is that it stops us suffering any nasty surprises when we open the fridge.

It could be visual, it could be chemical, or it could even be olfactory. Just as long as it cuts down on waste.

The idea we have in mind will be revealed in the **September** issue of Eureka! Until then, see what you can come up with. Submit your ideas by leaving a comment on the **Coffee Time Challenge** section of the Eureka! website or by emailing the editor: **paul.fanning@markallengroup.com**

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