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EDITOR'S COMMENT

PROBABLY THE MOST depressing communication to reach my inbox over the last month came from the Royal Academy of Engineering and was entitled 'Three quarters of young people do not know what an engineer is'.

Now the headline proved somewhat hyperbolic, since the story went on to reveal that in fact the research underpinning this release showed that over three quarters (76%) of young people aged 11 – 19 ‘do not know a lot’ about what those working in engineering do, despite nearly half (42%) wanting to pursue a career that makes a positive impact on the world.

For all that the picture wasn’t quite as bleak as the headline had suggested, however, the message was still a fairly disheartening one. After all, with years of initiatives designed to heighten awareness of engineering among exactly this group, 76% seems a very big proportion.

Happily, though, a recent encounter with Susan Scurlock MBE helped to lift the gloom. Susan is CEO and Founder of Primary Engineer Programmes. Primary Engineer has, over the past 12 years, created an engineering curriculum that spans Early Years, Primary, Secondary and Further Education institutions.

This ‘STEM by Stealth’ approach to education enables children and pupils to engage with practical maths and science alongside creative problem solving and literacy. The positive impact on individual children and pupils’ self-awareness and confidence through teamwork, and improvement in social skills through engagement with project work and links to the wider world and engineers.

By this means, Susan estimates that Primary Engineer has engaged with as many as 90,000 children over the years, helping them understand and appreciate the role engineering plays in their lives and that they could find a role in engineering.

Such an initiative deserves huge praise.

Paul Fanning, Editor

PRIMARY PURPOSE

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MISSION STATEMENT

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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.

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Cancer treatment could be dramatically improved by an invention at Canada’s University of Waterloo to precisely locate the edges of tumours during surgery to remove them.

The imaging technology uses the way laser light interacts with cancerous and healthy tissues to distinguish between them in real-time and with no physical contact, an advancement with the potential to eliminate the need for secondary surgeries to get missed malignant tissue.

“Intraoperatively, during surgery, the surgeon will be able to see exactly what to cut and how much to cut.”

Parsin Haji Reza, professor who leads the project.

The imaging technology works by sending laser light pulses into targeted tissue, which absorbs them, heats up, expands and produces soundwaves. A second laser reads those soundwaves, which are then processed to determine if the tissue is cancerous or non-cancerous.

The system has already been used to make accurate images of relatively thick, untreated human tissue samples. Next steps include imaging fresh tissue samples taken during surgeries, integrating the technology into a surgical microscope and using the system directly on patients during operations.

**Tech Brief**

Siemens’ Xcelerator, an integrated portfolio of software, services and application development platform that can be adapted to help companies of all sizes become digital enterprises.

Xcelerator combines the full portfolio of Siemens’ software for design, engineering and manufacturing with an expanded Mendix low-code, multi-experience application development platform. The Mendix platform includes cloud and app services for digital engineering and Internet of Things (IoT) powered by MindSphere, Siemens’ cloud-based, open IoT operating system, in addition to Mendix’s unified low-code and no-code development environments.

This platform drives digital transformation by enabling anyone in the ecosystem to build, integrate and extend their existing data and systems.

Tony Hemmelgarn, CEO, Siemens Digital Industries Software, said: “Unique to Xcelerator is the ability to build personalised applications that can capture feedback and performance and feed those insights back into design and manufacturing – delivering on the promise of the Digital Enterprise across the discrete and process industries.”

The company also announced that Siemens PLM Software has become Siemens Digital Industries Software, a change intended to reflect the growth in the company’s ecosystem and portfolio of solutions, applications, tools and services.
Additive solutions collaboration

3D PRINTING COMPANY, Stratasys has further strengthened its relationship with BAE Systems around emerging additive manufacturing (AM) solutions by providing the defence, security, and aerospace giant with increased access to new materials and production technologies currently under development.

Dave Holmes, manufacturing director, BAE Systems Air, said: “Already integrated across our production operations, Stratasys’ technology will continue to be vital in addressing and solving our current and future manufacturing challenges.”

Stratasys hopes to benefit from dedicated insight and guidance into specific existing and future needs demanded by the aerospace and defence manufacturer, seeing it as invaluable for steering future R&D programmes and the advancement of next-generation AM technologies.

Yann Rageul, head of strategic accounts for EMEA at Stratasys, added: “Stratasys’ close cooperation and knowledge-share with strategic customers like BAE Systems is paramount to ensuring we continue to stay ahead of the curve when it comes to developing and delivering additive manufacturing solutions that meet exacting application requirements within key industries.”

UPCOMING WEBINAR: TACKLING CAD MODEL CLEAN-UP FOR SIMULATION AND DESIGN

ON TUESDAY 15TH October 2019, Eureka! and International TechneGroup (ITI) will present a webinar hosted by ITI’s MD, Andy Chinn.

Today’s model-based enterprise demands ever greater reuse of 3D CAD model geometry across diverse simulation, design and manufacturing applications. Clean, reusable 3D geometry suitably adapted for downstream applications is a necessity.

The webinar will explore the issues that companies face as they attempt to leverage the value invested in their 3D CAD models across downstream applications and will look at what can be done in terms of methods, processes and tools to help meet these challenges.

Using select examples from global manufacturers, attendees will learn how to process CAD models geometry for optimal use in target simulation and manufacturing applications.

What will you learn during this session?

• How to recognise issues with 3D CAD models that can impact downstream reusability
• How to mitigate against CAD model re-use issues
• How to adapt and repurpose CAD models for use in target CAD, CAM and CAE applications
• Experiences with real world customer case studies and model clean-up examples
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DESIGN COHORT READIES NMITE FOR 2020

OCTOBER 2019

The solution to September’s Challenge for a way to monitor the food in your fridge and alert you when items start to go off comes from Sorex Sensor (a University of Cambridge spin-out). Its novel sensor technology is said to detect chemicals released as food ripens or starts to go off and can give several days’ warning so that the food can be consumed before it spoils.

The Sorex high-sensitivity mass sensor is based on film bulk acoustic resonator technology. It is extremely small – as thin as a human hair – and can be arranged into arrays on the same chip to measure different targets simultaneously. Fabricated on a silicon wafer, the sensor comprises a thin film of piezoelectric material that is made to resonate. As chemicals attach themselves to the surface, they change the resonant frequency – which provides an extremely accurate measurement of the amount of a particular chemical on the sensing area.

Just three to five sensor devices integrated into a fridge would provide an accurate, reliable early-warning system to monitor a whole range of food at the same time – from fruit, vegetables and salad to fish, meat and cheese.

Hertfordshire-based Ogle Models has produced a fully customisable, weight-balanced handle enabling tennis enthusiasts to enjoy the benefits of a fully bespoke racket to take their game to the next level.

Tennis racket specialist, Unstrung Customs, wanted a new and innovative method – away from the traditional moulding – to adapt the grip size of the racket. Working with Andrew Kelly of Skywide Design, Ogle focused on durability and accuracy throughout the development of the handles. Francisco Ruiz, managing partner at Unstrung Customs, said: “It’s clear that Ogle and Skywide have an established relationship as we were able to reach decisions and break through barriers very quickly and with ease.”

Selective laser sintering (SLS) was the most viable 3D printing process to achieve targets in robustness and weight, whilst maintaining the accuracy of the design. Also, if a player requires more than one handle, SLS is a cost-effective process for small batch production of different variants at once or multiples of the same.

Using a 3D printing process also enabled Unstrung Customs to speed supply from two weeks to under 72 hours and guarantee accuracy of each part, avoiding issues with alignment and grip area which had hindered the previous method of injecting polyfoam into the handle.

New handles please

SOLUTION TO LAST MONTH’S COFFEE TIME CHALLENGE

The solution to September’s Challenge for a way to monitor the food in your fridge and alert you when items start to go off comes from Sorex Sensor (a University of Cambridge spin-out). Its novel sensor technology is said to detect chemicals released as food ripens or starts to go off and can give several days’ warning so that the food can be consumed before it spoils.

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We started our business in 2012, designing and manufacturing medical simulation products with 3D printing.

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FIRING FOR FUSION

Although progress has been made towards producing fusion by magnetic confinement, gain is yet to be demonstrated. First Light Fusion is attempting a cheaper way: projectile fusion.

Formed in 2011, First Light Fusion was spun out of the University of Oxford by Dr Nicholas Hawker and Professor Yiannis Ventikos following work Dr Hawker had performed creating hydrodynamic simulations of shock-driven cavity collapse. These simulations showed that cavity collapse leads to inertial confinement of the gas inside the cavity and revealed that extreme states of matter could be reached, possibly creating fusion.

“We had six people at that time and the mission then was to execute an experiment to see if the simulations bore any resemblance to reality – which they did,” explains Dr Hawker. “Better than that, they were predictive which is very difficult – the holy grail of simulations.

“Basically, we measured the projectile velocity and then we simulated the target, looking to see if we were getting the right features in the right places at the right times, which we were. And we did that without having to tweak any fudge factors. So, that was fantastic.”

In Dr Hawker’s inertial confinement technique, a projectile is fired at a ‘target’ containing ‘fusion fuel’ (a mix of hydrogen isotopes, deuterium and tritium). The force of the projectile smashing into the target creates a shockwave that crushes the fuel in the target forcing the isotopes to join together creating helium and neutrons that – due to the fact they don’t interact strongly with matter – will stream out in a uniform pulse. For a fraction of a second, this reaction produces plasma that is hotter than the sun and denser than lead. The materials and shapes of both the projectile and the target are a trade secret these are the IP of, and hence the profit driver for, First Light Fusion.

This method is much less energy intensive and doesn’t require an expensive tokamak-style reactor, unlike the more mainstream magnetic confinement method that is being tested by large multi-national consortia like ITER in France. Despite the amount of money being funnelled into magnetic confinement it has not yet produced gain either.

Inertial confinement isn’t a completely new process, in fact there is a known source of it in nature – the pistol shrimp’s claw which is used to stun and kill prey. The mainstream project attempting to harness internal confinement to generate fusion is the National Ignition Facility at Lawrence Livermore National Laboratory in California, which uses powerful lasers that use a lot of energy.

First Light Fusion opened its own facility in 2015 and now employs 40 people. Earlier this year it moved from a two-stage gas gun, that could fire projectiles at speeds of 8km/s using a gunpowder charge and pressurised hydrogen, to something called Machine 3. Machine 3 is First Light Fusion’s pulsed-power fusion demonstrator which uses electromagnetic launch to fire projectiles at 20-30km/s which should be enough to generate temperatures of over a million degrees which in turn should produce neutrons and hence fusion.

“We measure this with high-speed cameras, we’ve also taken X-ray images of the target to allow us...
to see what’s going on inside,” says Dr Hawker. “But we can also make quantitative density measurements, so we know not only the velocity but also the density of what’s happening inside the target.

“That’s a very long-winded way of saying we have lots of different bits of experimental evidence, our code matches all of them, but the proof in the pudding is actually getting to fusion. The code says we can do it, so we’ve got to do it.”

Machine 3 is made up of six banks of capacitors, the top ones positively charged, and the bottom ones negatively charged to ±100 kilovolts. When discharged, all the switches close within 50 nanoseconds and the current flows into a vacuum chamber where a projectile is fired like in a rail gun at one of the targets. The highest current Machine 3 has demonstrated so far is 13.3 mega Amps which is comparable to 500 simultaneous lightning strikes.

However, the NIF device cost $4 billion whereas Machine 3 cost £3.9m. According to Dr Hawker, it’s more efficient too: “The shots we’re doing now are about 10% efficient from the stored electrical energy to projectile kinetic energy. The laser equivalent is stored electrical energy to laser light energy and that’s 0.1% efficient. So, it’s 100 times more efficient.”

This means, per joule of energy that reaches the target. Machine 3 is 1000 times cheaper.

A lot of data is being recorded and analysed from each shot, which means Machine 3 is averaging two and a half shots per week. The current the machine generates is recorded, as is the velocity of the projectile which includes high speed imaging and a velocity interferometer, which gives a 2D velocity profile of the front of the projectile to check if it is tilting. The pressure wave produced by the projectile hitting the target can also be measured, and finally there are neutron detectors and X-ray diagnostics. Dr Hawker says that they could be doing one shot a day without all these measurements, but they are essential to understand what is happening to refine the process.

“We have more to prove in terms of the science,” states Dr Hawker. “Fusion has never been demonstrated with projectile fusion before. We’ve
Actually torn apart and rebuilt the fundamental theoretical basis for inertial fusion to demonstrate that it is possible to get to gain from this process, and the simulations support that. But, if we do get the result, then we think our onward engineering is much much simpler."

The magic number in terms of theoretically achieving continuous gain is one shot every five seconds. Machine 3 isn’t ready for that, but the First Light Fusion team has plans as to how it will achieve this: “Basically, what we want to do is fire the projectile straight down on top of the target through the same port. There are other examples of technology where high-powered electronics are working at those sorts of frequencies, radar for example – although it is relatively different.”

Essentially, the design of Machine 3 is based on liquid metal fast breeder reactors that are used in the nuclear industry. Inside the reactor is a pool of liquid lithium which is pumped up to the top and falls in a cylindrical curtain around the ejector, through which the firing mechanism would drop the target and then fire the projectile at it. The collision will happen just above the surface of the pool, heating it from 250°C to 550°C. This is then recirculated through a separate loop to a heat exchanger, creating steam to drive a turbine, creating electricity.

The reason for this liquid curtain is to avoid one of the biggest challenges of nuclear fusion; neutron damage to the reactor’s walls. Dr Hawker explains: “Four fifths of the energy comes out as neutrons and you need to catch them. The problem here is that the flux of neutrons causes all known structural materials to become brittle over time, they crash into the solid material and they disrupt its crystal structure and cause displacements and weaknesses to be formed, and it loses its structural integrity over time.”

In a power plant components can’t fail, so replacement cycles are short. In a tokamak, some of the components need to be replaced every one to three years. That’s a problem because this happens right in the very heart of the machine, meaning extensive and regular downtime.

“What we can do with projectile fusion is invert this paradigm,” Dr Hawker continues. “Instead of having the coolant behind the wall, we can have it inside the vessel. You can’t destroy the crystal structure of a liquid, so neutron damage for this part is not a question.

“We’ve done the calculations and it does massively reduce the neutron flux. There’s a metric called displacements per atom, which tells you about the radiation damage to materials and we can reduce it more than we need to, we could reduce it by a factor of 100 if we needed to, which basically takes the lifetime of this from two years up to more than the lifetime of a power plant. So, you might say we’ve gone too far.”

The problem isn’t completely avoided because the reactor head is sat above the reaction chamber, but this is a small component in comparison to the whole wall of the reactor. The idea is to put all components that would need to be regularly maintained and replaced inside the reactor head, including the projectile injector, the target injector and the vacuum system.

Despite all this innovation, research, development and testing, Machine 3 is still not powerful enough to achieve gain.

“There’s two ways to make pulsed power machines faster; more voltage, which is really expensive; or less inductance, which requires clever engineering optimisation. That’s

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Get ready for Brexit
When we designed Machine 3, we looked at what was the state of the art and with this architecture we’re actually beyond the state of the art. But we’ve built it now, so the state of the art has changed.’’

First Light Fusion hopes to begin construction of Machine 4. The risk should be reduced as the company understands how Machine 3 works and has a validated simulation tool for the projectile.

Dr Hawker says that Machine 4 will be capable of gain, however, to get to a shot rate of one every five seconds, repeatably, will still take a lot of very hard work. But he has set a target of getting it done by 2024.

‘’It’s really hard to differentiate between different fusion technologies because it’s a deeply, deeply hard physics problem,’’ says Dr Hawker. ‘’The one thing I’d say is we’re aiming to have a predictive simulation tool; I don’t think any other fusion project has a predictive simulation capability. ‘’If we have a predictive simulation capability, that really shows that we genuinely understand the physics that is taking place inside that target, and that is what ultimately gives me confidence that the core technology will work.’’

As well as demonstrating gain in the next five years, First Light Fusion has partnered with the UK Atomic Energy Authority (UKAEA), a UK government research organisation responsible for the development of nuclear fusion power that has helped with some testing and will – Dr Hawker says – independently confirm the fusion demonstration, and with Mott MacDonald who is working with FLF on a reactor vision based on the technology. Both these things are expected to happen within this year.

This is being seen as a rich source of IP, not just for First Light Fusion, but for its partners too as the company won’t manufacture reactors or build powerplants.

’’IP for the power plant is not core to our strategy,’’ explains Dr Hawker. ’’We’re not daft, if we’ve got something we can patent we’re going to patent it, but our business opportunity is in designing, manufacturing and selling the targets. That will probably be something like one eighth of the total cost. The business opportunities for our partners in the supportive systems for the power plant is even bigger… and we think our opportunity is tens of billions a year.’’

Machine 3 is on course to demonstrate fusion by the end of 2019 and will continue to be refined while Machine 4 is being constructed and set up. Dr Hawker envisages this project as an opportunity for the existing nuclear value chain to use all its existing skills and expertise to build a completely different and much more publicly acceptable technology.
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Young engineers were given free rein to devise what the technological future for the Royal Marines might be and came up with some

ionic ‘invisible’ commandos carried into battle on silent ‘flying wings’ while hologram decoys distract an enemy pounded by rail and laser guns.

This is the futuristic vision of the Royal Marines dreamed up by Britain’s best and brightest young engineers, told to harness present and future tech to imagine how the Royal Navy’s elite troops might go into action in the future.

Young engineering graduates from the UK Naval Engineering Science and Technology forum (UKNEST), representing nearly a dozen leading defence, technology and engineering firms, were asked to plan a mid-21st Century assault by Royal Marines on an enemy missile site perched on a cliff-top.

They came up with a string of ideas – many previously confined to the realm of science fiction. These included exo-skeleton suits covered by a chameleon-like skin allowing wearers to perform super-human feats, such as scaling cliffs effortlessly, and blend with the environment. Manufactured from composite materials, this would be a lightweight carbon fibre structure embedded with load bearing alloy strands. The Human Universal Load Carrier (HULC) provides a weight-bearing frame allowing the Royal Marine Commandos to transport heavy loads of various equipment, for extended operations, greatly increasing their strength and endurance.

Nano-fibre pressure sensors woven into the Future Combat suit transfer the Commando’s motion into low power signals to drive motion. The HULC suit is actuated by a nickel hydroxide material, which responds to the low power signals to morph, and can exert and withstand forces thousands of times greater than its own weight.

The ‘fabric’ of the Future Combat Suit will be constructed from a synthetic polymer. Kevlar strands woven into the combat skin will provide protection equivalent to modern body armour.

This is the futuristic vision of the Royal Marines dreamed up by Britain’s best and brightest young engineers... to imagine how the Royal Navy’s elite troops might go into action in the future
ON THE TOPIC OF | FUTURE COMBAT

Out at sea, away from hostile forces. Dynamic fan drives are housed in an angular pod top and aft of the main body. Powered by a hybrid drivetrain comprising a compact gas turbine and dual carbon batteries, the fans will boost the Ekranoplan up to speeds of 300 knots (more than 20 times the current speeds). The vehicle can swiftly cover large distances from the carrier strike group, before switching to its batteries and water-jet propulsion system for low speed, silent manoeuvring as it approaches its insertion point to deploy the embarked team of Royal Marine Commandos. An active camouflage system embedded in the Ekranoplan’s hull provides enhanced stealth capabilities to the vehicle.

These were just some ideas. Others included “Holographic Marines” to decoy the enemy; helmets with displays providing Marines with the latest intelligence, battlefield info and details of a squad’s health and fitness levels; small intelligence drones which feed the latest information direct to commandos’ hi-tech helmets; boots that harvest energy as the commandos move to power radios and other equipment; and portable 3D printers producing food in the field.

The ideas were arrived at after graduates spent a day at the Commandos’ Training Centre at Lympstone near Exeter to understand what it takes to become a Royal Marine, some of the current equipment used and the challenges faced on real-life operations.

The engineers were then given the raid scenario and thrashed out ideas, looking at what troops would be equipped with, how to get them ashore from ships over the horizon, how the Marines would neutralise a protected target, how they might protect themselves and distract the enemy.

Graduate Chad Swaby, from the MOD’s Defence Equipment and Support organisation, came up with the idea of contact lenses with thermal imaging ability and artificial intelligence which can differentiate between civilians, enemy soldiers and hostages – from the way they move.

“We can use that information to let Royal Marines know who they need to target and who they need to save,” he added.

“The whole event has been a great opportunity for us to see what commandos do, what they have to go through. It’s helped me to understand what I need to give the marines to help them succeed on a mission.”

Major General Matt Holmes, Commandant General, Royal Marines said: “The Marines form over 40% of Britain’s special forces and are seen as the tip of the spear. Our objective has been to envisage radical capabilities to make us more agile and lethal.”

“We can’t say how much or how quickly the reality of these visions will come to fruition. But what we can say is that if only 20% of these ideas come to reality then we will be at the cutting edge of tomorrow’s technology.”

Defence Secretary Ben Wallace said: “It is tremendous to see the pioneering visions of young British engineers push the boundaries of technology and conventional thought. The Royal Marines have a long history of delivering unmatched capabilities across a wide range of scenarios and theatres. “As global threats continue to evolve and become more complex, it is vital that we encourage our armed forces and industry to work together to ensure our fighting forces strengthen their operational edge.”

The Marines form over 40% of Britain’s special forces and are seen as the tip of the spear. Our objective has been to envisage radical capabilities to make us more agile and lethal.
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Taking place on the 16th and 17th October at the Ericsson Exhibition Hall, Ricoh Arena, Coventry, EDS 2019 will feature 220 exhibitor stands and is expected to attract more than 4,000 visitors.

One of the many reasons for attending the event is the fact that it runs alongside a hugely-valuable conference programme featuring some of the leading lights in modern engineering design.

This year’s event will be no exception, featuring speakers ranging from 3M discussing the company’s unique approach to fostering innovation, through the UK’s first affordable industrial robot, to the designer of the world’s first smash-proof guitar.

Technology specialists and industry experts will deliver a series of pre-bookable keynote conference sessions on both days within two conference streams. All content has been approved and accredited for CPD points by the Institution of Engineering Designers.

The next few pages will offer a taste of what to expect.

For more information and to register to attend this free event, go to www.engineeringdesignshows.co.uk.
DAY ONE

09:15 - 10:00
The Interacting Elements of Innovation Culture
Ben Watson, Innovation Leader, 3M

Developing the cultural drivers for innovation to thrive and to balance innovation outcomes over time can be a challenge. At 3M we maintain and invest in several key elements to maintain this balance from sustaining core business to break through innovation through our innovation culture.

How might we define and better understand the cultural drivers and the necessary innovation management principles, with relevance for your own organisation?

10:15 - 11:00
Democratising robotics: The rise of the affordable industrial robot
Mostafa Elsayed, Co-founder & Co-CEO, Automata

Despite large-scale industrial robotics becoming commonplace over the past 50 years, we’re only now reaching an inflection point of mass adoption, with industrial grade robotics finally becoming affordable and accessible to smaller and mid-sized manufacturers. Automata co-founder Mostafa Elsayed will discuss the team’s mission to democratise robotics, their journey to creating a whole new category of industrial robot, the challenges and learnings to date and his vision for the future of automation for SMEs.

11:15 - 12:00
Using gamification to spark design inspiration & innovation
An Coppens, Chief Game Changer, Gamifi cation Nation

The workshop will look at what gamifi cation can bring to the design process for innovation. We will look at what gamifi cation is, the benefits and pitfalls. Then we will work on a number of innovation challenges and apply gamifi cation to explore options, combining tools to work with during the design process as well as experiencing tools for feedback on the design.

12:15 - 13:00
Bridging the gap from desktop to industrial 3D printing to improve e ciency
Leonardo Rodrigues, General Manager, EMEA, MakerBot Industries

Rapid prototyping is a central part of the design engineer’s workflow – essential for testing new concepts, verifying designs and meeting time-to-market goals. Regardless of the industry, or product, all engineers must consider the speed, accessibility, cost and output of these methods. However, a gap between desktop and industrial 3D printing solutions still remains, with desktop solutions insufficient for many engineering needs and industrial systems either too complex or too expensive. This session will explore how a new category of 3D printing could offer the solution to bridge this gap.

13:15 - 14:00
From VFX to real time product visualisation
Jarrad Vladich, Executive Producer, Emerging Technology, The Mill

From a con gurable car chassis to photoreal product visualiser, The Mill’s proprietary technology has become key in solving some of the TV and Film world’s biggest production challenges.

To find out more about The Mill Blackbird and Cyclops, join Jarrad Vladich, The Mill’s Emerging Technology Executive Producer in a showcase of The Mills ground breaking inventions, which are changing the way we visualise products in camera.

14:15 - 15:00
IP and realising its commercial potential
David Paton, Patent Attorney, Withers & Rogers LLP

Intellectual property (IP) can be used in a vast number of different ways. As a business you need to be clear on your IP strategy and understand the different ways that IP can add value to your business. It is therefore imperative for your business to understand the IP that it has, as well as the IP that it is developing.

The session will provide an overview of the different aspects of IP that businesses should consider to ensure that they are not neglecting the value of their IP, and advice on how to put IP to use in a cost effective and useful manner.

HP’S 3D PRINTING PLASTIC BUSINESS
Hear Ramon Pastor, Vice-President and World Wide General Manager, speak on day two at 13.15.
Introducing...
The Smash-Proof Guitar!
Phil Etheridge, Digital Marketing and Nylon Plectrum Expert, Sandvik
Amelie Norrby, AM Engineer, Sandvik
Tomas Forsman, Principal Engineer and Materials ILs Expert, Sandvik

Rock stars have been smashing guitars for decades, so Swedish engineering group Sandvik decided to test its cutting-edge technologies by building the world’s first all-metal, unbreakable guitar. They even let Swedish rock star Yngwie Malmsteen unleash his smashing skills on it—but it refused to break! See the amazing instrument and discover how Sandvik engineering and design experts applied sustainable, cutting-edge techniques—including additive manufacturing for the 3D-printed body—to make something that is both highly precise and amazingly durable.

10:15 - 11:00
Applying Security to Robotics
Michael Hart, Senior Robotics Engineer, Cambridge Consultants

Security is most often a second-class citizen when it comes to the latest technology developments, especially when those fields are still largely in academic research. This is true of robotics, where it is becoming more common to have mobile and autonomous robots with little to no guarantee of security. This talk aims to show the importance of starting the design of any robot product with a heavy focus on security. It also gives tips for both developers and consumers for staying secure and protecting privacy.

11:15 - 12:00
VR changing the way in which humans learn
Bradley Woodward, Managing Director, RiVR

An overview of how VR is being adopted by a wide-ranging cross section of commerce, education and health. Dispelling the myths and understanding how Virtual Reality will cause moral issues in the future.

12:15 - 13:00
People NOT Tech first: Designing for an ageing population – The IET, Design Council & Innovate UK
Alan Howard, Design and Manufacturing Lead, The Institution of Engineering and Technology (IET)
Dr Ambreen Shah, Director of Policy, Research and Communication, Design Council
Ben Griffin, Innovation Lead - Design, Innovate UK

We are experiencing a colossal demographic shift, living ten years longer than our parents’ generation on average and nearly two decades longer than our grandparents’ generation. With this come challenges but also major opportunities, especially for businesses. In this presentation we will talk through how a design driven approach has supported us to expose what really matters when designing for people in later life. It will also outline the funding opportunities that are currently available through the Healthy Ageing Industrial Strategy Challenge Fund that is seeking to support the mission set out by the Ageing Grand Challenge: to ensure that people can enjoy at least five extra healthy, independent years of life by 2035, while narrowing the gap between the experience of the richest and poorest.

13:15 - 14:00
3D Printing is disruptive, it drives differentiation and releases new opportunities
Ramon Pastor, Vice-President and World Wide General Manager, HP’s 3D Printing Plastic business

3D Printing is already big business. All around the world, manufacturing companies are using it to give them a competitive advantage: fast turnaround times, low costs, opportunities to create totally new business models. This revolution isn’t restricted to one or two markets. Any industry that relies on manufacturing can benefit from change, whether that’s through efficiencies or a new disruptive way of thinking.

14:15 - 15:00
How Brompton’s Designers Use Simulation To Advance Bicycle Development
Martin Haines, Application Engineer, Altair Engineering GmbH

The Brompton bicycle is an iconic, innovative and beautifully refined engineering product. To get where the company is today took many years of engineering development using very much a traditional build, test, break approach. Aside from the expense, sole use of this method is time consuming. Today, Brompton Bicycle’s designers are utilising simulation tools to help reduce development time; for both new developments and for existing bike improvements.

This presentation will detail how simulation technologies are helping the design engineers at Brompton Bicycle to ‘Design the Difference’, providing design insight earlier in the product development process to help to reduce weight, save cost and minimise the need for physical tests. Examples will be shown on various components within the Brompton bike structure, showing examples of topology optimisation for reduced weight and increased stiffness, structural analysis of the bike frame, assessing manufacturability of cast and even 3D printed parts and more.
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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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The British Engineering Excellence Awards were launched in 2009 to champion and celebrate design innovation and excellence. Since then, the BEEAs has multiplied in stature, as has the number of companies entering to win the foremost engineering accolade for marketing manager, National Instruments says: “The BEEAs always recognises a broad-range of innovative UK engineering firms, which align with the strong engineering and innovative heritage of the National Instruments brand. It also offers the opportunity to network with many eminent engineers and business leaders. National Instruments has sponsored the Young Design Engineer award to help celebrate British engineering accomplishments and support the industry’s most precious, valuable resource – the engineers of the future.”

The tenth British Engineering Excellence Awards ceremony took place at a gala luncheon on 4 October 2018 at etc venues County Hall, London.

WHERE ARE THEY NOW?

Since joining Jaguar Land Rover (JLR) in 2012, Orla Murphy – who won Design Engineer of the Year – has progressed through different roles in the business, in both the Electrical Engineering and Vehicle Engineering departments.

Murphy has worked in the audio team, calibrating vehicle sound systems using analytical, acoustic and both objective and subjective testing skills. In the quality team, she works in complex problem-solving for warranty issues.

This variety of roles is emblematic of a conscious effort to broaden her skill set. “Some people like to be an expert and will spend their whole life specialising in that field. Others are a bit more broadly focused and more interested in bringing all the parts...
together not only on the technical side, but also in terms of bringing the project together start to finish. You learn to be a good problem-solver and that’s a skill you can apply to almost any project. You can work in any company, any industry.”

Outside of work, Murphy is a STEM ambassador and public speaker, and gives technical lectures on her work for all ages, from schoolchildren up to retired engineers. “I’ve always been involved in teaching and coaching,” she says. “I’m now a fully-trained coach; I’m a fully-trained mentor; I’m a black belt sigma coach. I also deliver internal training courses on problem-solving.”

As a result of her work, Murphy was the IET Young Woman Engineer of the Year in 2016, the Royal Academy of Engineering Engineer of the Year in 2016 and was listed in the Telegraph and Women’s Engineer Society (WES) as one of the Top 50 Women in Engineering in 2017. She has given technical evening lectures for the Institute of Physics, IMechE, IET, and for Glasgow University. Orla is also the vice-chair for the IET Coventry and Warwickshire Committee and is a qualified coach and mentor.

Sheffield-based AESSEAL won the Engineering Ambassador of the Year Award and Grand Prix in 2018 for its work engaging young people in science, technology, engineering and mathematics (STEM) subjects and how promoting careers in engineering.

The company’s promotion of engineering as a study path typically starts at Year 6. This is less explicit than its work with secondary schools and colleges and often takes the form of sponsorships, ranging from sponsoring local Laughton Junior and Infant School to turn its £150 ‘loan’ into a profit in the ‘Make £5 Blossom’ initiative; to giving the Wacky Wobots team at Our Lady St Joseph’s Primary School a £5,000 grant to build and programme their robot Stevie 2.0 - which earned them a place in world finals of the Vex Robotics Championships in Kentucky, USA.

Every sponsorship or grant comes with an invitation to visit the AESSEAL global headquarters, where students get a chance to dismantle and rebuild a mechanical seal.

This encouragement continues all the way up to apprenticeship. Apprentices have an equal opportunity to work on the company’s state of the art machinery. In fact, Advanced Apprentice Nathan Wall was a member of the team tasked with overseeing the installation of the £1 million, 11 axis Nakamura Tome Super NTX, alongside senior management. Since redesigning its apprenticeship programme in 2012, AESSEAL has trained 100 apprentices. Of those 69 remain part of the workforce. In 2017, 21 apprentices joined the programme, of whom 20 remain with the business.

The 10th anniversary Awards will be taking place on 11 October 2019 at The Landmark London, and we hope to see you there. If not, visit www.beeas.co.uk after the event to see who won what, including the prestigious Design Engineer of the Decade.
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Designing a gearbox used to be a demanding mechanical engineering task. There was a lot to get right: optimising durability, efficiency and shifting behaviour; ensuring parts were inexpensive to manufacture and easy to assemble; meeting stringent packaging constraints.

These challenges remain, but a modern gearbox is likely to be a sophisticated electromechanical assembly, controlled by powered actuators, monitored by sensors and managed by complex software. It now requires collaboration between multiple groups, each with their own specialisms: mechanical and electrical design engineers, software developers and data analysts.

This is repeated across the world of manufactured products, but rising product complexity is only part of the story. Sub-assemblies and sub-systems are increasingly likely to be engineered by different suppliers. Also, carmakers now offer additional functionality during the life of their products, and in industrial equipment, manufacturers use remote links to monitor the performance of their products in the field.

THE DATA GAP

“The challenges facing today’s manufacturers are formidable, but they are compounded when companies find themselves with the wrong tools for the job,” says Graham McCall, vice president of operations at Aras. “Specifically, the systems used to manage product data are struggling to keep pace with the requirements placed on them by modern engineering and business processes. Companies strive to create continual “digital threads” that connect their products from concept to end-of-life, but often, those threads are broken.”

It’s not hard to see why. The majority of product lifecycle management (PLM) systems have roots that stretch back to the early days of computer aided design (CAD). As companies moved from paper to electronic drawings, and on to 3D models and simulations, it became clear that they needed systems to manage the growing volumes of data these tools produced. CAD evolved into product data management (PDM) as systems gained the ability to manage bills-of-materials, capture and formalise engineering standards and rules, or generate multiple product configurations from a common underlying dataset. PDM then evolved into PLM, which was intended to extend the common data architecture across the boundaries between disciplines, engineering phases and organisations.

“PLM has failed to deliver its objectives for two fundamental reasons,” explains McCall. “First, most...
existing PLM systems haven’t broken free from their roots in mechanical CAD. They do some things very well: handling product geometry, materials data, assemblies and complex configurations for example. But they struggle with others, notably the integration of the software development processes that are a central part of many products. This leaves a gaping hole in processes that usually get filled with a patchwork of sub-par tools like Excel spreadsheets, shared drives, e-mail or Dropbox. None of these connect to the PLM system or each other.

Second, typical PLM implementations are often notoriously slow, difficult and expensive to deploy. Companies can spend millions of pounds and thousands of hours, to find they have a solution that covers only a fraction of their processes, products and business activities. And once that PLM system is up and running, changing it is just as difficult. That makes it difficult for companies to seize new opportunities – evolving their internal processes and external offerings to take advantage of new technologies or shifts in customer demand.”

**THE BIRTH OF RESILIENT PLM**

“Organisations are learning that they can’t tackle today’s challenges with their existing data infrastructure,” McCall adds. “What they need is a resilient PLM platform to make them successful in their enterprise-wide digital transformation. One that is flexible, scalable and upgradable.”

A resilient platform is one that can accommodate the modern agile approach to IT implementation. Companies need the ability to deploy systems rapidly and adapt them quickly to meet their changing needs. That calls for a fundamentally different software architecture. Instead of hard-coding business logic, services and database structures into the platform itself, these elements need to be accessible and adaptable, implemented as models that can be changed quickly and inexpensively. “A scalable PLM solution is one that meets the needs of all current and potential users,” McCall says. “That requires a clear separation between a company’s data and the tools used to create and access it. Only a few individuals need the ability to generate the geometry of a component, for example, but many hundreds may need to access and review that model without paying thousands a year for access to the original authoring tool.”

According to McCall, the digital thread that interconnects throughout lifecycles won’t be spun out of legacy CAD tools. It will be woven around them, and the other tools, data sources and business processes.

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With food manufacturers being continually squeezed on price by retailers and asked to fulfil orders for supply that can seem, at best, challenging and at worst highly unrealistic, improving productivity is a priority. Tight timescales mean many lines are already running on a near 24/7 basis, leaving little leeway for even scheduled maintenance, let alone an unexpected breakdown. This can lead to overcautious service and maintenance regimes, which are expensive to support, but preferable to unscheduled downtime.

Short supply or delayed delivery due to plant failure damages a business’s reputation and impacts on the relationship with the customer. And as many food and beverage manufacturers find to their cost, customers such as supermarkets can’t support empty shelves, which makes them very demanding customers indeed.

**AVOID GRINDING TO A HALT**

Many production line failures are not characterised by a sudden fault that results in immediate line stoppage, often it is a gradual degradation. So, before the line eventually grinds to a halt, it might have spent a considerable period producing inconsistent goods – that add to bottom-line costs, due to waste.

“The good news is that random equipment failure doesn’t have to be a fact of life,” explains John Rowley food & beverage industry sales manager at Mitsubishi Electric: “Modern condition monitoring sensor technology can be easily retrofitted to rotating plant and equipment, while many of today’s plant and machine controllers have advanced monitoring and diagnostics functions built in.”

Taking advantage of these technologies can quickly take food and beverage companies into the realm of predictive maintenance, where businesses can see advanced warning of impending failure, with enough time to plan repairs during scheduled maintenance periods rather than being hit with an asset failure out of the blue.

**FROM PREVENTATIVE TO PREDICTIVE**

A conceptual and technological leap forwards from preventative maintenance, intelligent predictive maintenance ensures an asset is serviced only when needed, helping to increase both productivity and efficiency. Predictive maintenance spots equipment problems as they emerge and develop, providing ample warning of impending failure, and so helping to maximise asset availability.

“Importantly, these predictive maintenance solutions are not complex,” Rowley says. “Frequently they are simple and cost-effective to implement, and often can be built from functions that already exist within the plant’s control equipment.

“Take, for example, the add-on sensors that have been developed to monitor the increases in operating temperature, excessive current draw, changes in vibration characteristics and significant shifts in other operating parameters that can all be indicative of impending problems in rotating machines. Today these sensors come with embedded..."
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‘smart’ functionality, revolutionising condition monitoring.”

A simple add-on to pumps, motors, gearboxes, fans and more, these sensors use a simple traffic light system of red, amber and green lights to provide at-a-glance monitoring of the condition of the machine. They can also be connected into wider factory automation networks using Ethernet and a managing PLC for a smarter solution.

FROM TRAFFIC LIGHTS TO TELEMETRY

In isolation sensors offer a great start point to implementing preventative maintenance strategies, but there are limitations to the traffic light warning system. While it indicates that a problem is developing, it gives no real clue as to what the problem might be or just how serious it is; it offers no practical recommendations as to how the problem should be addressed; and, while it shows problems developing on individual machines, it fails to provide an overview on the asset health of the plant.

“It is these limitations that Mitsubishi Electric has addressed with the Smart Condition Monitoring (SCM) solution,” states Rowley. “The kit provides an integrated approach to monitoring the condition of individual assets and enables a holistic approach to be taken to monitoring the asset health of the whole plant. Individual sensors retain the traffic light system for local warning indication at the machine, but at the same time information from multiple sensors is transferred over Ethernet to a Mitsubishi Electric PLC for in-depth monitoring and more detailed analysis.”

The SCM kit is a plug-and-play solution with sensors that can be added to machines as and where required, and a simple teach function allowing the sensor and controller to learn the normal operating state of the machine, generating a memory map of key parameters.

Rowley adds: “Once set up, the SCM provides 24/7 monitoring of each asset, with functions including bearing defect detection, imbalance detection, misalignment detection, temperature measurement, cavitation detection, phase failure recognition and resonance frequency detection.”

Linking multiple sensors into the control system enables the controller to analyse patterns of operation that are outside the norm and alerts the operator when attention is needed. The SCM analysis provides detailed diagnostics, offers suggestions for where additional measurements should be taken, and provides maintenance staff more precise error identification. It is even said to make recommendations as to what rectification actions should be taken via text messages. This information can be networked to higher-level systems for ongoing trend analysis across all the assets around the plant.

HOW IT SHOULD BE DONE

Muntons Malt, one of the UK’s largest producers of malted barley uses the SCM system to protect fans and motors in its production process. It had previously experienced issues with difficult-to-reach bearings inside a large fan housing and was forced to make an unscheduled stop to a line to make repairs.

The SCM system was then installed on two 315kW and a 90kW fan sets. The company now has a very clear picture of any maintenance needs in advance of needing to make physical changes.

The system can work autonomously of any other automation, with multiple sensors located and recognised by unique IP addresses. However, at Muntons Malt the visual information as well as the alerts were connected into the existing automation software platform.

For multi-site businesses, this ease of connectivity can aid in quickly changing over production schedules from one plant to another to fulfil the most pressing orders or can alert remote maintenance teams of the need to perform more detailed diagnostics.

IT MAY ALREADY BE IN YOUR DRIVES

This information isn’t just coming from external sensors. Modern drives, PLCs, SCADA systems and other automation products have comprehensive diagnostics capabilities inbuilt, monitoring not only their internal workings but also parameters such as current draw, voltage and temperature in connected motors, pumps, fans and compressors. All of this helps to build a detailed picture of the health of plant assets.

With a simple plant network backbone, this information can be shared around the plant and beyond. Indeed, this sort of functionality is a key aspect of Industry 4.0 and is at the heart of the benefits of the digitalisation of production.
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LINEAR MOTION

TURNING THE TABLES

New ground is being broken in the design of positioning tables.

Linear motion and its associated systems don’t always get the attention they deserve. However, that does not mean there aren’t some fascinating innovations and applications out there.

One of these is in the field of linear tables. These are used in the most diverse fields of application. Due to their compact design consisting of guide and drive system, they can be used economically and efficiently in many areas. And anyone who wants to manufacture with precision should also be able to position precisely, because precision machining starts with an exact positioning. The motion control specialist Aerotech has developed a completely new series with the IGM motion platform in order to get away from rigid positioning systems.

The new linear tables are significantly more flexible and scalable than conventional positioning tables.

The development was initiated by Norbert Ludwig, managing director of Aerotech GmbH in Fürth. Aerotech has revived a concept already contemplated before. The Integrated Granite Motion Systems (IGM systems) are a scalable alternative to conventional positioning tables with a granite substructure. “The idea behind IGM is as simple as it is effective: We no longer position a complete linear adjuster on granite, but its individual components, so that the guide, drive and measuring system are mounted directly on the granite and not via the detour of a complete adjuster”, says Aerotech’s managing director, explaining the design and layout of the motion platform. “We are thus offering motion components as a product group for the first time and no longer as a purely special solution for the customer as we have done so far.” In this way, tailor-made IGM linear tables meet all requirements of different applications. And the advantage for customers in the European market: the positioning systems are configured to customer specifications at the German location in Fürth.

In the classical design, linear adjusters are screwed onto a flat granite base as a counter mass, in order to be able to safely accelerate and move large masses. Although IGM motion platforms have already been manufactured in special production, due to the flexible component concept, Aerotech applies this one-off production characteristic variably to the series and, using the components, assemblies and application-specific positioning table according to customer requirements.

Compared to conventional positioning tables with granite substructure, the new IGM linear tables offer higher rigidity with reduced overall height and...
consequently, increased flexibility in design. Depending on the special application, travelling distances, payload and dynamic performance, for example, can be adapted to suit. This ultimately leads to higher positioning accuracy and better dynamic performance.

In addition, IGM systems are often more compact due to the better integration of the machine components into the granite structure. Different versions with mechanical or air-bearing axes are available. For the drives, ball screw and linear motor are available as options. In addition, various feedback options are available, ranging from simple encoders to laser interferometers. Finally, additional motion elements such as rotary axes, lifting devices, piezo nano-positioners or even galvanometers can be integrated into the IGM axes – all components can be controlled centrally via Aerotech’s A3200 machine control.

“Nevertheless: IGM must not be understood as a finished product, but as a concept to show how customer-specific motion systems can be constructed flexibly”, admits Norbert Ludwig. “We can, for example, show how the axes and guide rails can be arranged in order to design the system according to the customer’s requirements.”

For discrete adjustment systems which are not available from the standard product portfolio, a designer needs all individual adjusters in a special design. This significantly increases the time and effort required for the processes from design to production. Mechanical processing must also be redesigned, including the creation of new machine programmes. This takes time, of course. The IGM, however, does not require a new design for every linear adjuster. For example, a 1200mm x-axis with 800mm y-axis can be quickly implemented once the design of the granite plate has been determined. Within certain limits, the design can be adapted quite well to the conditions of the designer. Nevertheless, you should not ignore that a high flexibility also has disadvantages, because the design is fixed in this case. For example, the y-axis cannot simply be extended in retrospect, because this would result in a new design. And because of the installation, the service can only be carried out on-site at the customer’s premises – the customer cannot replace any components on their own.

Usually, customer applications can be found in precision measuring and machining technology with adjustment ranges of up to 2 metres. If, for example, standard adjusters are no longer able to work at a length of 1 metre, because the milling machines can only process longer profiles with a great deal of effort, this would not be a problem for an IGM system. You can build any length, 1.50m, 1.80m etc. – without having to redesign it again.

“Our new IGM systems, for example, can be used in micromachining, but this is not necessarily a core area”, explains Brian O’Connor, product manager at Aerotech. “We support machine tool suppliers with solutions at the component level, such as motors, controls or drives, and also with high-precision positioning systems.”

Norbert Ludwig adds: “Although we have customers for our rail-on-granite platforms from the watchmaking industry, among others, the flexible positioning systems for various industrial applications can also be designed for mechanical engineering and the automotive industry, for example in the fields of measurement technology, testing and inspection.”
Eureka! Knowledge aims to provide useful content and tools to help make your designs more efficient, cost-effective and commercially successful.

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New: Telescopic (monitor) support arm

RK Rose-Krieger has expanded its support arm system for its RK monitor mounting with a telescopic support arm (basic length 495mm). In its extended state (720mm), it is designed for monitors, display devices and operating terminals weighing up to 5kg. With its new support arm, RK Rose-Krieger expands its combination options and enables greater ergonomic adaptation of end devices to the working environment.

For use as an individual support arm or as multiple support arm systems together in combination with RK monitor holders. This makes them ideal for use in control rooms where multiple monitors and display devices are frequently placed above one another. The support arm telescope enables the quick and easy ergonomic arrangement of any number of monitors in a range of formats.

The monitors can be flexibly height adjusted, swivelled, extended and fixed... all without the need for tools.

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CONCEPT TO REALITY
One of the biggest challenges many design engineers face is that they’re just too smart. They come up with brilliant offerings that feature the latest innovations, technologies, contributing quantum shifts in terms of development in their space; and then they run aground trying to properly explain what it is they’ve come up with.

They struggle to articulate why a customer, investor or stakeholder (who is so well versed in the status quo) would want to make the change from what they’re comfortable with to the brave new world that has been created by the design engineer.

This is where great marketing comes into its own and performs a vital function, bridging the gap between a sensational idea and a saleable one. Here’s how it works: Human beings love things they can relate to and identify with. They love authentic differences and character. They love narrative and novelty. Even the most analytical souls are emotionally driven at their core.

It’s for these reasons that no matter what you’re selling, regardless of how serious, professional, or ground-breaking it is, we must like the people and the story behind it before we’re able to engage with the logical rationale behind buying it.

This is why we have to use our marketing materials and messaging to simplify complexity. Here are a few ways to do this:

**TELL A STORY**
Whether it’s your origin story, the eureka moment that inspired your current offering, or a real human impact story from your work, a story is a great way to make something technical and complex relatable.

**GIVE IT A PERSONALITY**
A strong identity that goes beyond logos and brand guidelines to a strong set of values and a distinctive tone of voice that could belong to an actual human is a great way to make your offering relatable and real.

**GIVE IT A FACE**
Related to the previous point, giving your team centre stage in your brand marketing is a great idea as they are, by definition, very real and human.

**USE A BIG IDEA**
Finally, and possibly most effectively, you can use a big idea to explain a complicated or mundane thing. Whether it’s using an easily understood analogy or metaphor to explain or taking something complex and illustrating it with a simple image, the big idea works for any product, service or brand.

Hopefully these ideas have sparked a few thoughts about how you can start to get your key stakeholders to engage more fully with the brilliant work you’re doing.

Which group do you find struggles most to understand your latest innovation? Is it the procurement people at your customer’s business? Consumers? Your own Board? We’d love to know, so do get in touch and share your thoughts.
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FIFTY SHADES OF GREEN

In this time of increasing demand for clean and renewable energy, companies are looking at any means necessary to produce extra energy that doesn’t rely on fossil fuels or other ‘dirty’ methods.

With the mass-adoption of electric models, the automotive market is going through the biggest sea-change since the internal combustion engine was introduced, replacing the horse and cart.

However, there are questions being asked about the green credentials of electric vehicles (EVs). Some claim that the emissions from the manufacture of EVs – specifically their batteries – are a lot higher than the manufacturing methods used to build traditional road vehicles.

The materials that make up the batteries of EVs include lithium, cobalt, manganese, nickel and graphite. These are not – as is frequently stated – ‘rare earth metals’. Some are simply harder to find than others. Moreover, the mining of these materials is a political issue, as some are mined in countries with poor human rights records, which is simply unpalatable.

The real problem is how the electricity that powers the vehicles has been generated. Using coal-powered electricity, EVs do nothing to cut emissions, using natural gas electricity they’re like a top hybrid and using low carbon power they result in less than half the total emissions of the best combustion vehicle, manufacturing included.

THE CHALLENGE

This month’s challenge is to come up with an idea for increasing the amount of electricity that powers an EV, or more specifically, smaller components, by purely renewable, free energy.

The obvious solution is solar panels but, given that the UK averages just four hours of sunlight per day – 1460 hours a year – why not see if you can come up with something that can power specific components all day long, all year round.

The idea we have in mind will, of course, be revealed in the November 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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What
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