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 *A dynamo who has thrown herself into everything in order to ensure as many young people as possible are exposed to ... engineering.* 

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LOOKING TO THE FUTURE

Entries to the Engineering Ambassador of the Year category show that many individuals and companies are looking to enthuse students about engineering



GRAHAM PITCHER
CONSULTING EDITOR
MA BUSINESS

Engineers solve problems; it's as simple as that. Some solutions are elegant, some inspired, but the vast majority are high quality designs in which appropriate technology is applied to solve a particular problem.

Previous British Engineering Excellence Awards have seen winning entries ranging in size from chip designs to pipe laying systems, with the Grand Prix – the best of the best – awarded to a kinetic energy recovery system, an engineer who designed a system to save water on a massive scale and, this year, a company developing breakthrough LED manufacturing technology. It just shows the breadth of the UK's engineering capability.

The great thing from the judges' point of view is that every year the quality of entries into the Awards improves – and 2017 was no different.

We've always held the belief that engineering is a people business and three Awards this year highlight that. Our Young Engineer of the Year Rob Hanson is doing great things in developing solutions to the problems faced by the disabled, while our Design Engineer of the Year Jake Wallis is principal engineer for a company developing a compressor based on a radical design. Not only has he developed a new way of creating the complex surfaces required, he's also shaking up the way products are designed.

But perhaps we should focus on the new Award this year – Engineering Ambassador of the Year. It was a hotly contested category, but the judges were unanimous in selecting Iulia Motoc as the winner, calling her 'a dynamo who has thrown herself into everything in order to ensure as many young people as possible are exposed to ... engineering'. And the judges were pleased to see so many companies and individuals looking to highlight to a range of children the excitement offered by a career in engineering.

Please join me in congratulating all those who made the shortlist for the 2017 British Engineering Excellence Awards and, in particular, our winners.

“ The great thing from the judges' point of view is that every year the quality of entries into the Awards improves – and 2017 was no different **”**

IT'S A KIND OF MAGIC

The development of a more efficient way to make LEDs has put Plessey in the right place in the right market at the right time

Few people would disagree with the contention that innovative technology can make a significant difference. While that difference can affect individuals, it can also have a global effect – and innovation in lighting technology definitely falls into the latter category.

LED lighting is highly energy efficient, with the potential to change the future of lighting. According to the US Department of Energy, residential LEDs can use at least 75% less energy than comparable incandescent lamps, while lasting up to 25 times longer.

It goes without saying that LED lighting has almost limitless application, but there are areas in which it excels, including floodlighting and street lighting.

While almost every LED light manufacturer is using gallium nitride (GaN) technology for the LED itself, it is generally mounted on a sapphire substrate for commercial reasons as it is much cheaper to do it that way than to using GaN on silicon carbide. But while GaN on sapphire maybe less expensive, it has some performance issues. When GaN on sapphire LEDs are scaled up to meet the needs of floodlighting and similar applications, light absorption increases significantly and this means efficiency drops. Sapphire also has low thermal

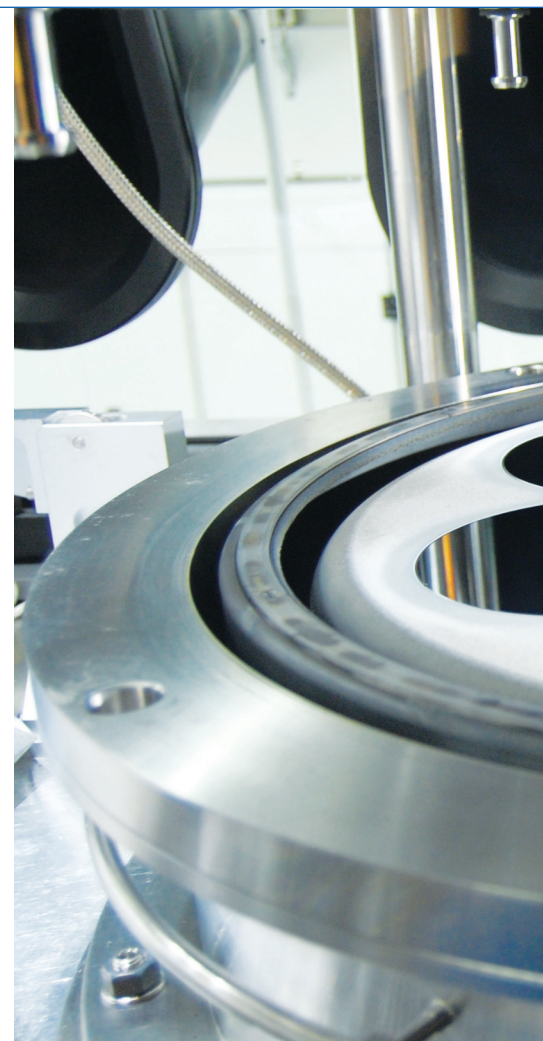
conductivity, which means heat sinks need to be used, increasing product size and cost.

LEDs could also be made more cost effectively if they were produced on larger wafers; currently, more than half of all GaN on sapphire LEDs are produced on 4in wafers.

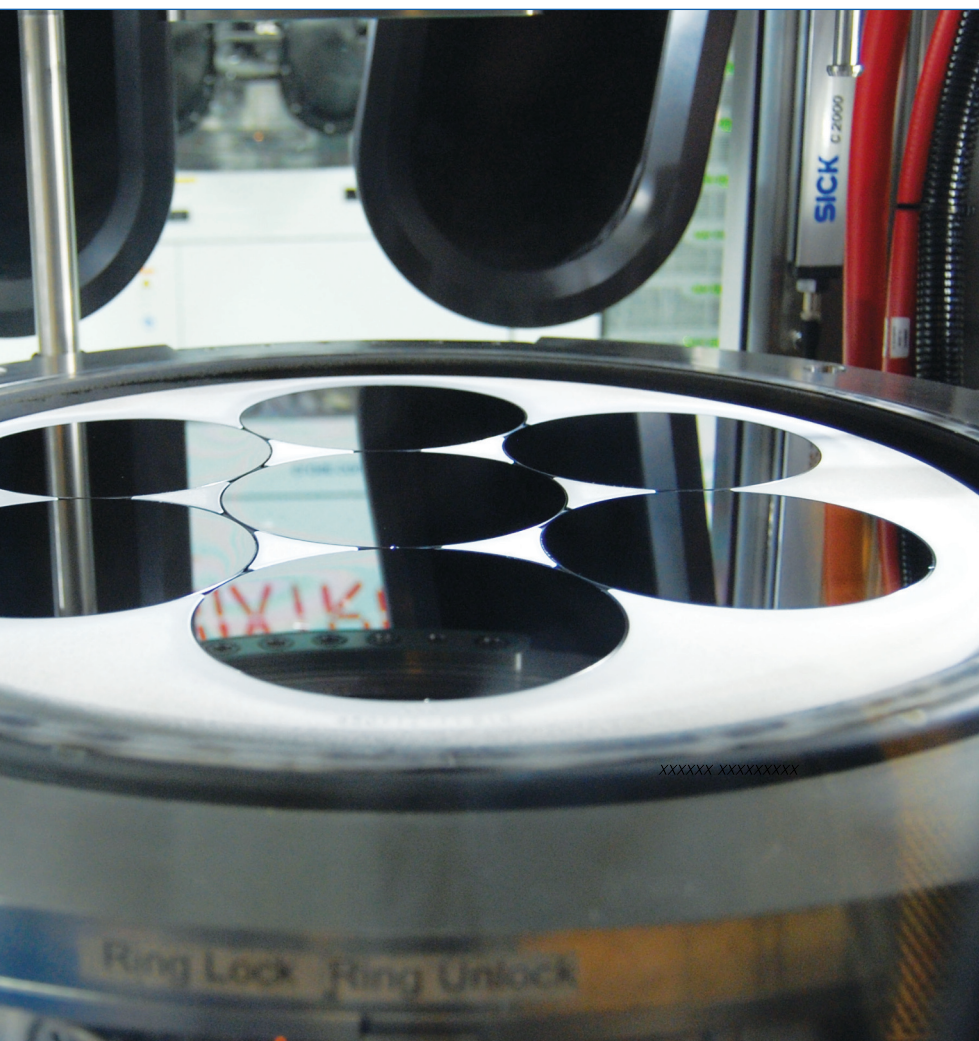
Looking to address these issues, Plessey Semiconductors has developed GaN on silicon (GaN on Si) technology. According to the company, GaN on Si LEDs not only emit more lumens per unit area, but also dissipate heat more quickly. The result, it claims, are smaller, more reliable LEDs.

There's a good reason to select silicon as a substrate; one is the economies of scale available following decades of process technology development. And, compared to other ways of making LEDs, GaN on Si devices are said to be easier to make, with fewer masks and more tolerance to mask misalignment. This results in better yield.

While the arguments appear sound, manufacturing GaN on Si wafers is not without its challenges. One is that GaN and Si have different band gaps, potentially bringing thermal strain through different coefficients of thermal expansion. Plessey has solved this problem by using a buffer layer



between the two materials. Another challenge is that silicon absorbs light. This has been solved using a second silicon layer featuring a mirrored surface to reflect light.



Plessey's technology development has progressed to the point where it can make 6in GaN on Si wafers, bringing a range of performance and commercial advantages over other approaches.

It has deployed this technology in its LUCIAN PLW7070 LED, in which a single die GaN on Si LED produces 30% more light than comparable devices at half the cost.

WHAT THE JUDGES SAID

It looks to the judges like Plessey has created the right product for the right market at the right time. In particular, its development of GaN on silicon technology has helped to improve LED efficiency and the judges are heartened to see innovation from a UK semiconductor company.

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CONSULTANCY POWERS AHEAD

'First principles thinking' and a strong emphasis on simulation solve powertrain challenges

Carmakers continue to look for transmission systems for their traditional vehicles that save weight and feature less noise, vibration and harshness (NVH). But that concern has expanded recently to include electric and hybrid vehicles.

These requirements have seen the appearance of a number of specialised consultancies, including Drive System Design (DSD). Celebrating its tenth anniversary this year, DSD focuses on the engineering of transmission and future electrified powertrains. Its simulation led approach has seen its reputation for technical excellence and agile development capabilities grow across the world. Teams of design, control, test and development engineers, allow DSD to collaborate at any point in the design cycle, from concept to analysis, design, development and validation. It can also help with turnkey solutions and subsystem or component development.

With specialised expertise in the design and integration of electric drive units for electric and hybrid vehicles, as well as bespoke actuator applications, DSD's current focuses include highly efficient transmission design optimisation, eMachine design and control, and electric vehicle/hybrid architecture specification.

According to DSD, the company was created with the satisfaction of delivering top quality engineering in mind, rather than maximising profit. This benefits its clients because the advice provided is candid and impartial. The approach to projects includes 'first principles thinking', with a strong emphasis on simulation. This brings innovative concepts and designs more quickly. In turn, employee retention is high and all the graduates that DSD has recruited are still with the company.



One of its specialities is overcoming problems that have defeated conventional approaches. From developing new design methodologies that avoid the compromise between the size/durability/efficiency/noise of bevel gears, to inventing an automated oil detection system that reduces breather test duration and frees key staff, its approach is based on good engineering leading to optimum results.

In an example of its abilities, a DSD project team took a design from a simulation model to prototype within six months. It has also created a communications interface between EV control systems in a bus electrification project.

Recruiting the best people and investing in them through training and mentoring has brought stability in DSD's workforce and secured long-term relationships with customers. Its turnover in 2017 is expected to reach £10million; four times that of 2012.

WHAT THE JUDGES SAID

“Drive System Design has shown consistently strong and focused performance whilst working in a demanding industry sector. It's interesting to see the growth in its turnover during the last five years, as well as its investment in control and transmission technology for the emerging electric vehicle market beginning to paying off.”

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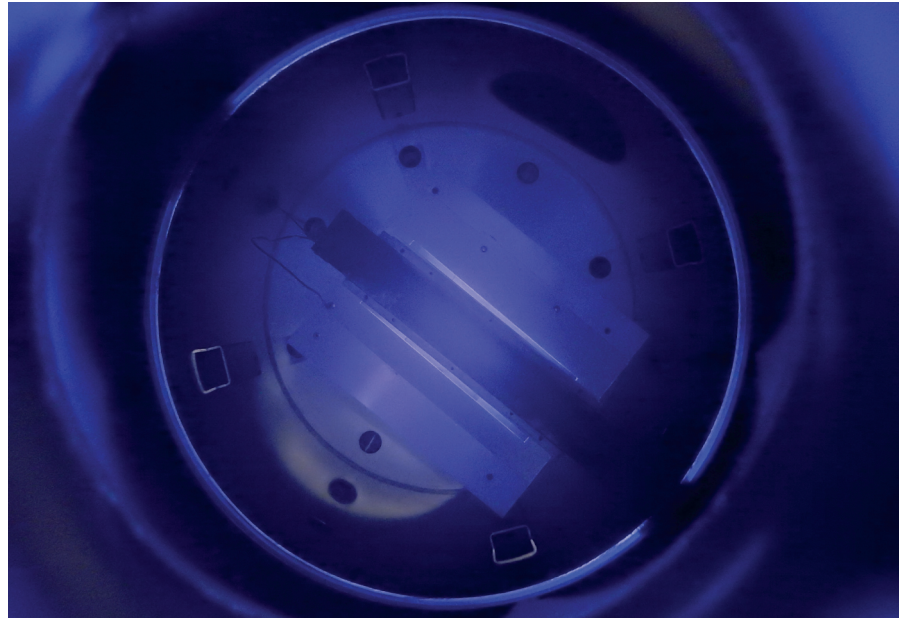
A specialist surface treatment process has brought growth, exports and new market opportunities

Surface treatments are valuable ways to extend the lifetime of critical components in equipment where reliability and minimum downtime are key factors. But these treatments often require sophisticated and lengthy sublayer preparation, followed by post processing operations such as polishing.

But Diamond Hard Surfaces (DHS) has developed an amorphous diamond material, called Adm that gives extended life in high temperature, chemically aggressive and abrasive environments. And it does this in an efficient manner. Using a patented process, DHS can coat substrates ranging from steel to thermoplastics, endowing components with reduced friction and wear resistance, whilst improving their load carrying characteristics. The coating can also be applied at relatively low temperatures, which means there is minimal effect on the substrate material and the process is applicable to a wider range of materials.

One of the challenges facing small companies is competing with larger organisations; often multinationals. DHS provides a fast reactive service that allows it to engage quickly with potential customers, to identify their needs and form solutions. It points out that it does not have a 'one size fits all' approach; its patented technology allows it to provide a tailored solution which cannot be matched by competitors. In particular, it points to its ability to provide harder, lower friction, thicker and more wear resistant coatings with better thermal conductivity and electrical resistance.

The company works closely with universities, supporting MSc and PhD students, learning more about the properties of materials and opening new



market sectors. As well as being engaged in a number of Innovate UK supported collaboration programmes, a continuous improvement process in its manufacturing environment has brought new innovations in how its materials are produced.

In 2016, DHS more than doubled its turnover and the company says it is on target to increase this by a further 50%, with around 60% of its business coming from export sales. Production capacity has been increased by 50%, while the manufacturing area has been doubled. With an ambitious business plan for future growth, the company has customers in a range of market sectors including electronics, aerospace, oil and gas and chemical processing – industries where reliability and minimum downtime are key. And DHS has recently been approved by Leonardo Helicopters as a first tier supplier.

WHAT THE JUDGES SAID

“The judges not only recognised a wide range of potential applications for this company’s technology, but were also impressed by the increase in its turnover, as well as the high level of export business. Its appointment as a tier 1 supplier to Leonardo helicopters was also seen as a major achievement.”

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AFFORDABLE ROBOTICS SOLUTIONS

The young and dynamic start up that's bringing low cost prosthetics to healthcare markets around the world

In the final year project for his Honours Degree in Robotics at the University of Plymouth, Joel Gibbard designed and created a prototype low cost prosthetic hand, something that his professors said would not be achievable in two university semesters. That achievement saw him named Young Design Engineer of the Year in the 2014 British Engineering Excellence Awards.

That year, Joel co-founded Open Bionics and this year, the company's first medical device – a 3D printed bionic hand – has been CE marked and entered a clinical trial with NHS England for children aged from 8 to 18. According to the company, this is the first clinical trial of its kind.

When they founded Open Bionics, Joel and co-founder Samantha Payne set out to investigate a number of assumptions about the US and UK prosthetic markets. They spent more than a year validating their product and business plan assumptions, which resulted in Open Bionics developing a robust business model and product, with a focus on cost, weight, size, style and control. This approach has seen it raise more than £1m from a range of investors, including Intel Capital.

One of the questions to which the judges need to see an answer is how a start up believes it can succeed in its chosen market. Open Bionics points out there are more than 2million upper limb amputees around the world and more than 11m amputees. But it adds that the market for robotic devices to assist victims of strokes is even larger.

Looking to serve this market, it is developing what it claims are affordable robotic systems that enhance the human body. Early customers will include hand



amputees, as well as children with limb-differences. Devices will be sold directly to customers, as well as being available through private and public healthcare clinics. This model, it contends, is scalable to different countries.

And with young people in mind, Open Bionics has signed what it says is a 'one of a kind' licensing deal with The Walt Disney Company, allowing it to sell bionic limbs featuring their favourite characters such as Iron Man. A similar agreement with Deus Ex allows limbs to feature video game characters.

With supplier agreements now in place, Open Bionics is getting ready to manufacture and serve the UK market this year. It also has plans to soon serve the US market as well.

WHAT THE JUDGES SAID

“While its main focus is on developing affordable robotic prosthetics, Open Bionics impressed the judges with commercial relationships struck with leading multinationals, as well as with the NHS. With significant interest from investors, clinical trials in progress and plans to start manufacture in the near future, Open Bionics is poised to make a major impact.”

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BOXING CLEVER

Design team packs a lot into a small time frame to create a remarkable packaging system

Engineering, more often than not, is a team effort. That might be relatively easy within a small company where those with different specialities use the same office. But the challenges increase in scale when designing a product that requires multiple locations to be involved.

Comprehensive market research and analysis undertaken by Kliklok identified an opportunity to develop a mid-range, flexible and compact, integrated cartoning system. The system needed to offer competitive speed and handle the wide range of carton sizes required by companies in the bakery and confectionery market.

Ideally, the machine would reduce the number of operators required to run a topline packaging line; integrate several packaging processes into one short footprint machine; offer a suitable combination of mid-range speed, carton size and carton style; and be hygienic in design, ergonomic, offer easy access and be user friendly. It would enable three packaging processes: forming topline cartons automatically, use robotics to pick and place products into the cartons; and close the cartons using hot melt glue. And the system would require only one operator and one touch screen.

Looking to take advantage, Kliklok formed a dedicated project group featuring engineers from Bosch in Switzerland in order to combine their relative technical skills and expertise. But the team had a hard deadline – Kliklok wanted to launch the new system at Interpack Germany, which took place in May 2017.

The project team comprised eight people – four from Kliklok and four from Bosch. Between them, they brought a mix of mechanical, electrical, robotics and project



management expertise.

Kliklok admitted there were some obvious challenges; there were two groups, two countries, two languages and eight opinions. These problems were overcome, however, with daily video calls, weekly project workshops and site visits.

A series of 'quality gate' milestones were established to monitor progress in the various stages – specification, design, software, components, procurement, assembly, safety, risk assessment and test. While the input of each engineer within the team was crucial, team work was paramount.

According to Kliklok, efficient communication, mutual trust, respect for each other's expertise and sheer determination allowed the objectives to be met and the system was successfully launched at Interpack earlier this year where it was met by a receptive audience.

WHAT THE JUDGES SAID

"The judges were impressed by the team's good, honest and practical engineering, delivering an impressive output from a multinational project in a short time."



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SHINING A LIGHT

Developing GaN on silicon technology has given Plessey a significant advantage in the LED market

There has been significant adoption of LED technology in the past few years as companies look to make savings through energy efficiency.

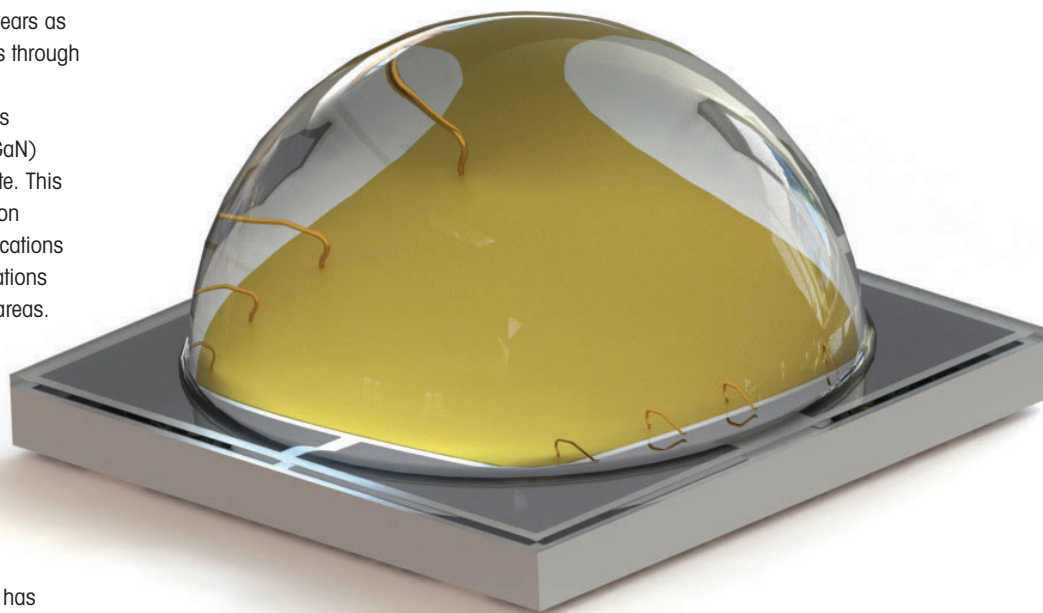
Today, most LED light sources are made from gallium nitride (GaN) fabricated on a sapphire substrate. This is a cheaper approach than silicon carbide or GaN itself. But complications start to appear in lighting applications that require large LED emission areas. However, when the sapphire substrates are scaled up, light absorption increases dramatically, reducing emitter efficiency. Meanwhile, sapphire is more expensive to produce in larger formats because of its crystalline format.

GaN-on-sapphire technology has other performance issues. Sapphire's low thermal conductivity requires heat sinking, which takes up space and increases system cost. And stacking LED active layers onto sapphire substrates decreases optical efficiency and, with it, light output.

An alternative approach to the use of GaN on sapphire is to create LEDs using GaN on silicon technology. Plessey says this allows more lumens per die area, while the thermal conductivity of the silicon substrate means heat can be dissipated more quickly. As a result, GaN-on-Si LEDs are more reliable, require less heat sinking and take up less space.

But with dissimilar thermal expansion rates, a GaN emitter mounted onto a silicon substrate is exposed to thermal strain, which can affect performance and long-term reliability.

To resolve this problem, Plessey has developed a patented technique for GaN-on-



Si production, with a buffer layer between the GaN and silicon layers acting as an intermediary to mitigate the mismatch.

Plessey has used this approach to make the LUCIAN high power PLW7070 LED, which it says provides 30% more light output than competitive devices and with better thermal performance.

LUCIAN LEDs are said to be particularly useful in large formats, where standard sapphire-based LEDs often struggle. Looking to solve this problem, LED manufacturers have used multiple dies to create larger modules – but this leaves a tell-tale 'cross-hair' shadow in the middle of the beam. Plessey says its technology eliminates the 'cross-hair' effect and sets a new benchmark in applications such as spotlights, downlights, floodlights, streetlights, high bays and portable flashlights.

WHAT THE JUDGES SAID

“Designing a better LED is the latter day equivalent of designing the better mouse trap. While LEDs can save energy, they bring design challenges. By developing a GaN on silicon process, Plessey is now showing the way forward.”

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A TOUCH OF CLASS

A touch sensor that enables force to be used as an additional input vector is set to change the touchscreen forever

Since the launch of the Apple iPhone, users of all kinds of technology have been accustomed to the use of touch interfaces. Two main kinds of touch technology have been deployed – resistive and capacitive. While both bring benefits, capacitive touch technology has won the battle.

Yet capacitive touch technology has issues. Despite dominating touch-control applications, capacitive technology only operates in the X and Y dimensions, as well as being vulnerable to ‘false touches’ and it’s unable to work in tough conditions.

Three senses are typically involved in human interaction – sight, hearing and touch. While the first two are well developed, touch remains problematic. In fact, Peratech says touch has been the most difficult sense to implement in smart products. Looking to overcome this, it determined there was not only a need to sense touch, but also the intent, indicated by the applied force.

Peratech’s 3D Multi-Touch Matrix Sensor is a passive array of force touch sensors based on its QTC technology. The array not only determines position in the X and Y axes, but also adds the third-dimension of pressure. Working even with gloved hands and with styli, the sensors are said by Peratech to open a whole new world of control options, including force based zoom, scroll and select.

QTC sensors can also be used beneath or on the perimeter of a display or lighting source and will work with tactile-feedback systems – even those made of leather or wood.

Humax has recently integrated a QTC multi-touch matrix sensor into its AwareTV platform, while several mobile phone OEMs and display manufacturers are evaluating



the technology for integration into mobile handsets.

Peratech suggests that product functionality can be expanded by taking advantage of force as an additional vector. For example, a button or menu selection can be enhanced with multiple options. This approach features in the Humax Remote Control, which allows the selection of content to be previewed, watched or moved to picture-in-picture with a single press of varying strength. Alongside consumer electronics applications, Peratech is confident that its sensor technology will find use in smart home and domestic appliances, automotive systems, industrial equipment and medical devices.

WHAT THE JUDGES SAID

“While capacitive touch is finding broad application in a range of consumer and industrial products, Peratech’s matrix sensor adds another dimension to interface technology and there is an impressive range of potential applications.”

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INSIDE THIS ISSUE: ENGINEERING MATERIALS



MAGAZINE

September 2017

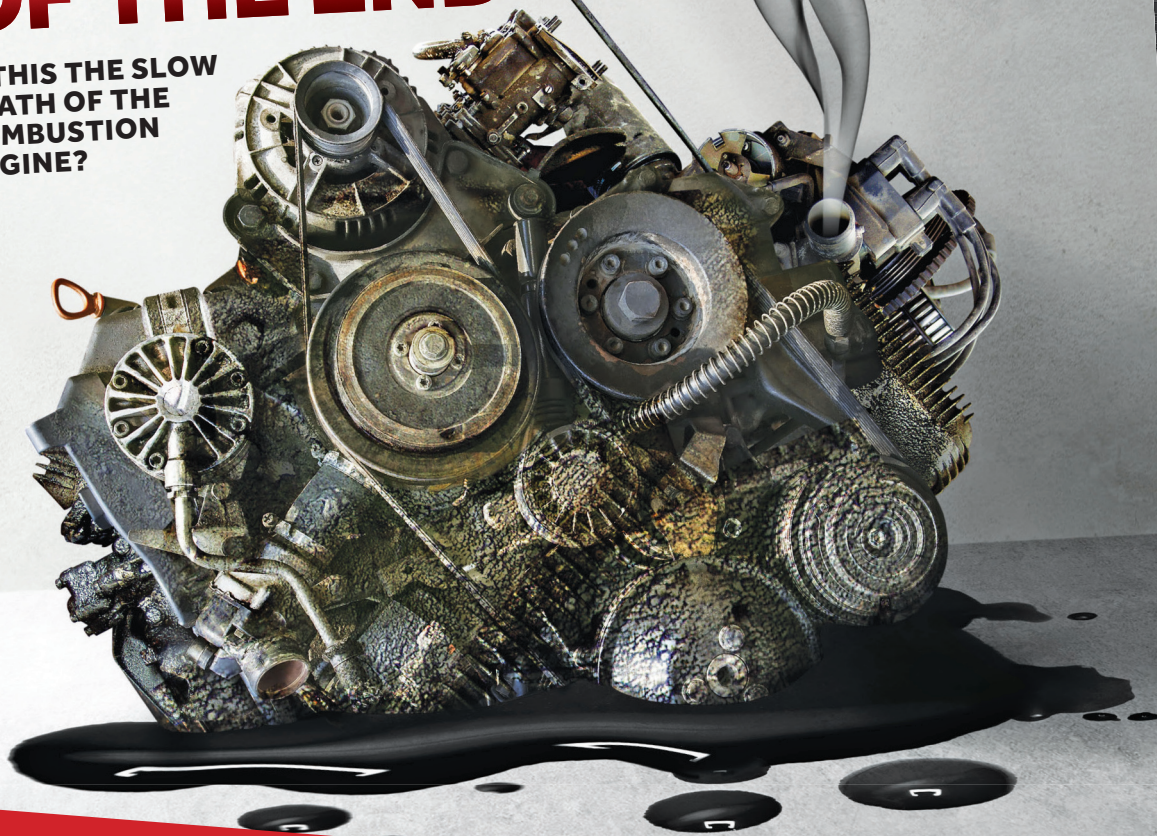
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ON A CHARGE

High speed boost device enables smaller engines to generate more power while cutting fuel consumption and CO₂ emissions

While autonomous vehicle technology has grabbed many of the headlines in coverage of the automotive sector recently, work continues to be undertaken to make engines more efficient.

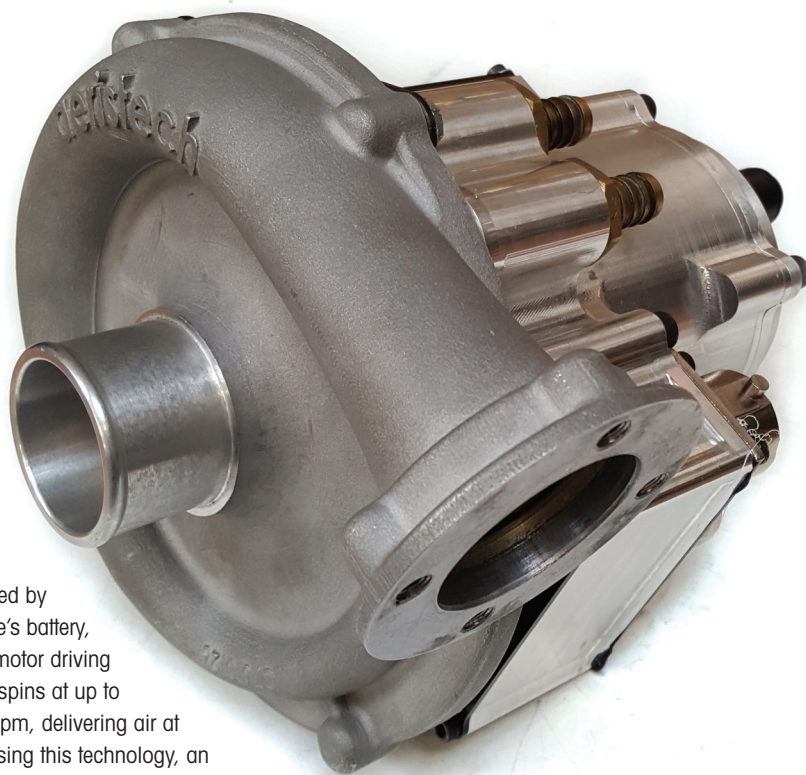
In the 100 years or so since the invention of the internal combustion engine, efficiency has increased slowly. Today, the most efficient engines – including those used in Formula 1 – only manage to convert 50% of the energy contained in fuel into what is termed useful power.

But as efficiency improves, carmakers can design smaller engines into their products. One way of viewing this problem is output power, which can be defined as a function of the rate at which fuel is burnt. In turn, this is a function of the amount of air which can be introduced into each cylinder during induction.

Aeristech says that when its sole Supercharger – or sCharger – is fitted to an internal combustion engine, it can result in previously unattainable levels of specific power output to be realised.

With sCharger, a variable speed centrifugal compressor is fitted to the engine air inlet manifold, increasing pressure and the amount of combustion air supplied. By matching this with an increase in the rate at which fuel is supplied, power output is increased. Efficient operation is said to be achieved by matching precisely the amount of air to the amount of fuel by varying compressor speed.

According to Aeristech, this allows a smaller engine to do the work of a larger one. In fact, it says an engine fitted with an sCharger can deliver the performance of a regular engine with at least twice its capacity, whilst reducing fuel consumption and emissions by at least 25%.



Powered by the vehicle's battery, the 9kW motor driving sCharger spins at up to 120,000rpm, delivering air at 2.3bar. Using this technology, an 800cc engine is capable of delivering 96bhp. Aeristech says the 1litre engine in a Toyota Aygo delivers only 51bhp.

The motor can not only supply full airflow load within a second, overcoming the perception of 'turbo lag', but also has high electrical efficiency. And by running at 120,000rpm, a higher boost pressure can be delivered.

In the past, turbochargers, superchargers and compound chargers have been used to boost power output, but Aeristech says sCharger replaces all these devices and the company is targeting hydrocarbon fuelled engines with capacities ranging from 800 to 1200cc. Considerable interest is said to have been attracted from the Indian and Chinese markets.

WHAT THE JUDGES SAID

“There is a pressing need to improve the performance of small engines and hybrids. The sCharger brings back the response provided by a traditional supercharger without the power losses. And, it gives engines boost without the compromise of turbolag. **”**

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THE ART OF SIMPLICITY



FINDING A NEEDLE IN A HAYSTACK

A missing person's mobile phone can be used to pinpoint their location during emergency mountain rescues or disaster relief

Looking for a missing person in a remote location can be as problematic as looking for the proverbial 'needle in a haystack'. Many search and rescue operations have no other choice than to simply 'look out of the window'.

But Smith Myers believes it has created a solution to the problem with Artemis, which uses the missing person's mobile phone signal as a location beacon.

The concept was initially developed by an avionics airframe manufacturer, who believed that traditional direction finding techniques could be used, with a fixed carrier from the mobile phone.

Further analysis of this concept determined that a bulky direction finding antenna would be required and that this would only give bearing and distance information. The latter information would be derived from relative signal strength indication (RSSI), something which is not very accurate when it comes to mobile phones. Smith Myers' approach was to use the cellular protocol to perform distance estimates, rather than RSSI. This approach would allow two standard omni antennas to be used.

With its knowledge of cellular protocols, Smith Myers developed distance estimation algorithms for GSM, UMTS and LTE based networks. It notes that inherent limitations of some protocols required the specific design of transceivers and algorithms.

According to the company, Artemis will work with any phone and doesn't require an app to be downloaded. The system will determine the missing person's location and display it on a map, with directional information enabling the helicopter to overfly the location. An additional feature of Artemis is that it enables voice and text



communication with the mobile phone.

Artemis can be used even when there is no cellular network, enabling it to be deployed in remote areas, deserts and mountains, as well as when the local infrastructure may have been destroyed. Flight trials of the system have shown that a mobile phone can be located to within 100m at distances of more than 30km, even when the aircraft was above cloud and rain.

Mindful of the space constraints of aerospace applications, Artemis has been designed to fit into an ARINC 600 case. Careful layout meant the product passed DO160G and MilStd810G requirements for fixed wing and rotary wing aircraft.

WHAT THE JUDGES SAID

“ Searching for a missing person in a large area is a challenge, so anything that helps has to be welcomed. Artemis is based on the mobile phone, something most people carry with them, and provides an elegant solution that could be rolled out in other applications, such as disaster relief.”

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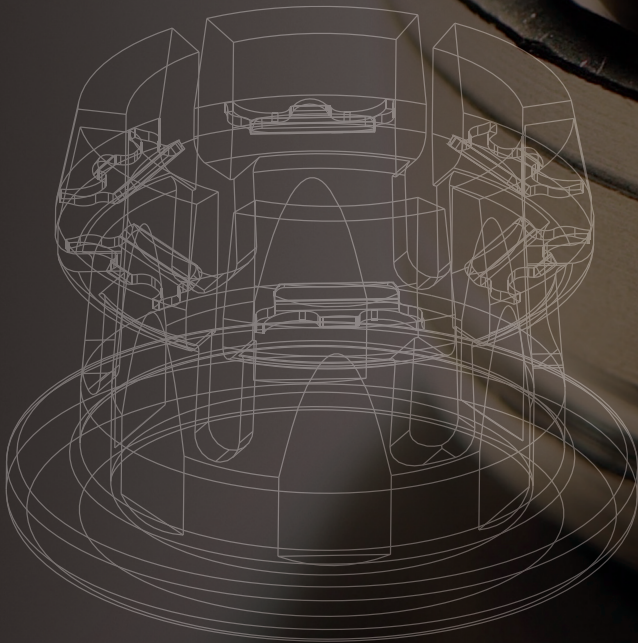


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PROMOTING THE FUTURE

By throwing herself into a range of STEM related activities, Iulia Motoc is helping children to get a better idea of engineering as a career

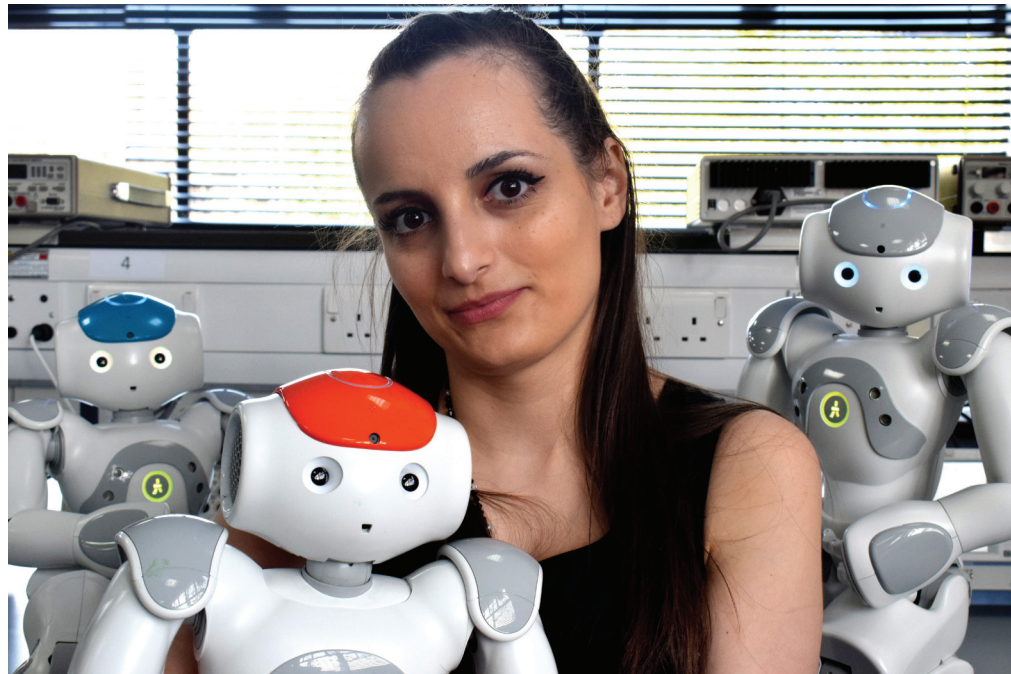
There is general agreement that the UK faces an engineering skills crisis, with the number of people leaving the profession exceeding the number preparing to follow a career in engineering. One of the solutions that has been put forward is to work with younger children to promote science, technology, engineering and mathematics – the so called STEM subjects.

But it's not the only solution. All around the country, companies are working with local schools to promote engineering, by sponsoring schools to enter STEM related competitions or by providing work experience opportunities. Whichever approach is chosen, the company or individual needs to be passionate about the cause of engineering and technology.

Iulia Motoc has been involved in more than 30 local and national outreach activities during the past year. She is an Academic Ambassador for the University of Kent and a STEM Ambassador, but has recently been appointed an Ambassador for the Queen Elizabeth Prize for Engineering.

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, Iulia has been involved with summer schools and science extravaganzas.

As if that wasn't enough, Iulia 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.



Iulia says the summer school was her favourite event, with students able to learn more about bipedal robots, program and interact with them. A further benefits was the work being done in groups, improving their team work.

According to Iulia, she received an invitation a year ago to visit a primary school in Kent to demonstrate robotics. After spending a day at the school working with pupils of all ages, giving them tasks to complete and the opportunity to interact with robots, Iulia realised she wanted to give more students the opportunity to see what engineering is.

Iulia's ambassadorial activities take place alongside work on a PhD based on robotics at the University of Kent. This work includes developing grasping and walking algorithms for bipedal robots.

WHAT THE JUDGES SAID

“Iulia is a dynamo who has thrown herself into everything in order to ensure as many young people as possible are exposed to the potential of an exciting career in engineering and technology.”

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AN UNSUNG HERO

Rob Hanson is bringing 'better technology for everyone', including those with disabilities

Graduate engineers represent a significant part of the future for the UK's industry. As employers look to refresh product lines and address new markets, young engineers can make an impact by bringing fresh approaches and fresh thinking. But it's not all about planes, trains and automobiles.

Rob Hanson 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. Designability is a national charity whose engineering and design experts have a passion for creating life-changing assistive technologies. An 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.

Rob's recent work has included the design of a wheelchair baby carrier, dynamic seating for young children with dystonic cerebral palsy, and the development of Wizzybug, a powered wheelchair for children younger than five years old.

Rob has 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. Rob has helped to lead focus groups, where his ability to listen and passion for understanding have helped him to develop solutions.

In one of these focus groups, Rob 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 and Designability is looking to commercialise the idea.

Alongside these projects, Rob has worked with students at Bath College, challenging them to develop a product that solved real life challenges, including using a guide dog, deafness, and cycling with osteoarthritis. Following their course, three of the seven students are beginning an engineering and design related university degree. And he has been involved in the Smallpeice biomedical engineering summer course at Southampton University, aimed at 16 to 18 year olds, where he delivered a 'design and make' course targeted at products for people with a disability.

Rob is said to be a dedicated problem solver and to be thorough in all aspects of his work. Designability says he is a talented engineer whose drive to develop himself and his good natured enthusiasm are a rare combination.

WHAT THE JUDGES SAID

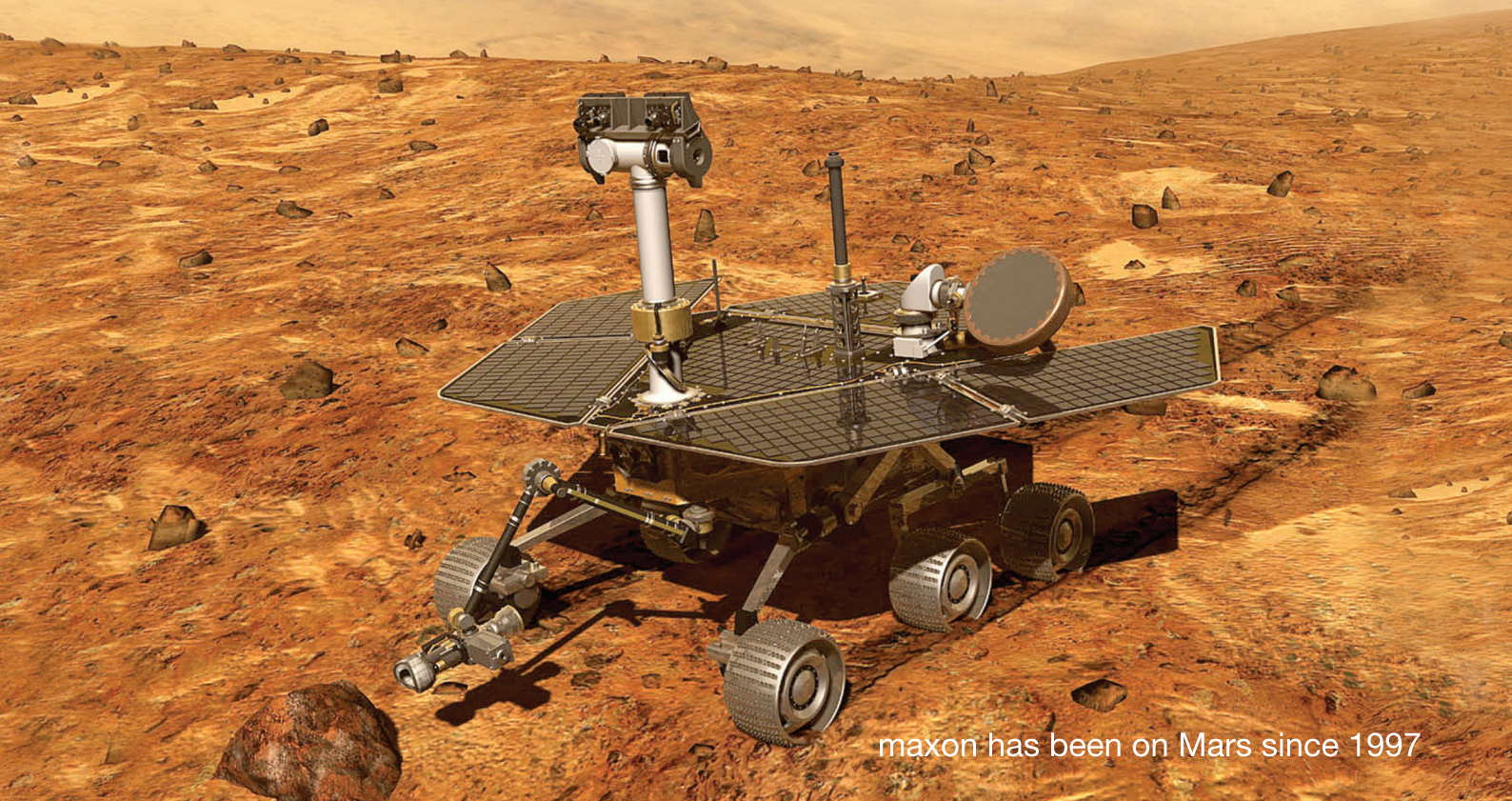
"Rob Hanson is an unsung hero, exhibiting excellent use of engineering skills in a difficult arena. He has delivered great designs and is a shining example to other engineers."

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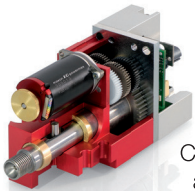


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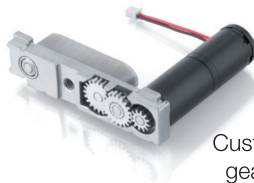
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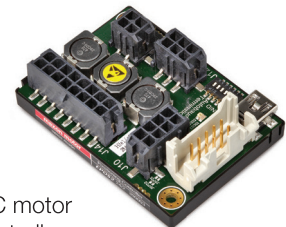
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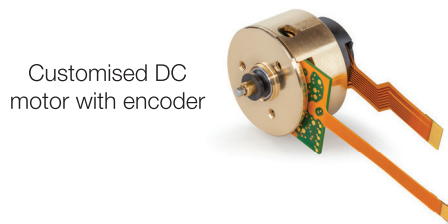
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A YOUNG BLADE

This young engineer is helping a small company to push the boundaries of compressor design, while changing how it creates new products

Over the history of the British Engineering Excellence Awards, the various judges have seen numerous examples of engineers going 'above and beyond'. Not only do they show design excellence, they are also helping to improve the design cycle by reducing design time, promoting a culture of innovation and helping to impart a desire to understand and explore.

Jake Wallis joined Lontra in 2012 as a design engineer, demonstrating immediately his ability to understand requirements, then to use physical and mathematical principles to evaluate potential solutions. According to Lontra, he recognises that good design relies on the successful union of many elements.

Lontra's flagship product is Blade Compressor, which it says is the first 'clean sheet' compressor to be designed for more than 80 years. While the first version of Blade Compressor was available when Jake joined Lontra, the company admits there was 'considerable scope' for its improvement. Jake contributed to this improvement in a number of ways. Firstly, he designed an oil free 37kW compressor capable of running at an operating pressure of 10bar. Funded by an award from Innovate UK, the prototype of this two stage compressor is now running and will be developed into a commercial product.

He has also addressed the fundamental geometry of the compressor rotor where it interacts with mating parts and his work is the subject of a patent application – one of 10 Lontra filings in which he is a major contributor. Because Blade Compressor is oil free, it depends on close running clearances for air sealing. Jake's design is said to be a significant change to how these surfaces are created, improving air sealing and helping with manufacturability.



While Lontra says it has a flat structure – the company has just 17 employees – Jake has now been appointed its principal engineer, with responsibility for providing leadership and inspiration.

As part of his role, he has changed the design process so that engineers work more closely to create more sophisticated and commercially appropriate products. Through the use of appropriate techniques, designs can be created more quickly, with the amount of time spent at the concept and modelling stages reduced by 10 weeks.

Alongside supervising Lontra's first work experience placement, Jake is developing aptitude tests to improve recruitment of mechanical engineers.

Outside of the 'day job', Jake represents Lontra at meetings of the British Compressed Air Society and assists at Formula Student events.

WHAT THE JUDGES SAID

“Although still a young engineer, Jake has led the design of a flagship product from a clean sheet, while reformatting the company's infrastructure in order to speed the design process. In his short career, he has already been involved in 10 patent filings.”



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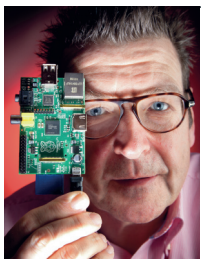
ERIC WILKINSON, CHAIR

Chief Executive Officer of Cambridge Consultants, Eric has managed projects as diverse as the development of the latest in anti terrorism radar, a machine to produce premium frozen drinks and the world's most intelligent iron. A materials scientist by training, Eric is a regular speaker at international conferences



DR ANDY SELLARS

Andy worked as an engineer and consultant before joining Innovate UK's High Value Manufacturing team, with responsibility for advanced materials and electronics. He developed the business case for the Compound Semiconductor Applications Catapult, for which he is Chief Business Development Officer.



PETE LOMAS

Pete, director of engineering at Norcott Technologies, has designed products for a diverse range of industries. His passion is encouraging the next generations to engage in STEM subjects and is a co-creator of the Raspberry Pi, serving as a trustee of the charitable foundation.



RICHARD POULTON

Hardware team leader and part of the senior management at Navtech Radar, Richard manages an engineering team addressing new product R&D, project management, customer project engineering, site work and supplier management. He also plays an active role in European regulatory groups.



PHIL MAYO

Phil has had a long career in the EDA sector and is now leading Altium's UK operation. A visiting industrial fellow at the University of Hertfordshire and chair of the Electronics & Communications Industrial Advisory Group for the School of Engineering, he is committed to the success of the UK electronics industry.



PHILIPPA OLDHAM

Philippa discovered her love of technology at her local garage. With a Master's degree in mechanical engineering, Philippa joined QinetiQ as a mechanical design engineer and rose to become product manager for its £150m aerospace business. She is now head of transport and manufacturing with the IMechE.



ALEX MCDIARMID

As a young design engineer, Alex' practical design skills and understanding of industry allowed him to make a significant contribution at Parker Bestobell, where he designed and developed a successful range of high pressure valves. Since winning the 2016 Design Engineer of the Year Award, Alex has established a design consultancy.



DR MIKE IRVINE

Mike has more than 30 years experience of healthcare product development and has been instrumental in bringing novel imaging, therapeutic, diagnostic and sensing technologies to market. His product development activities are complemented by business development and alliance management experience.



GRAHAM PITCHER

An engineer by training, Graham has covered developments in the electronics industry for 37 years. He also has broad expertise in computer aided design, industrial automation and computing technologies. He has been involved with the development of New Electronics for more than 20 years.



JUSTIN CUNNINGHAM

After graduating with a first class honours degree in Aerospace Engineering, Justin worked at Astrium Space under Colin Pillinger on Beagle 2. Since then, he has been writing about technology and has presented an engineering television series for the Discovery Channel. He also hosted the 2015 awards.



SIMON BENFIELD

Simon has spent the past 30 years in the Civil Engineering sector. He has worked on a variety of engineering projects in the highways and marine engineering fields. Currently head of Ramboll's Bridges UK team, Simon is a Chartered Engineer and a Fellow of the Institution of Engineering Designers.



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