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"This year, we had another 'dead heat' — this time for Design Engineer of the Year. Both, in their own ways, show what's great about UK design engineering."

Graham Pitcher,

Group Editor,

Findlay Media

Engineering Design Division

Graham Pitcher
Group Editor, Findlay Media
Engineering Design Division

Into the fast lane

UK design companies are stepping up to help the automotive industry solve some of its challenges.

"Almost in stealth mode, the UK has become one of the design communities of choice for the world — and the automotive market is a leading example."

A lot of noise has been made of the decline in the UK's manufacturing capability. Whilst it is undoubtedly true that the UK isn't making as much as it used to, it remains the world's fifth largest manufacturing economy.

Less attention has been paid to the UK's design sector; something which makes a substantial contribution to the nation's GDP. Almost in stealth mode, the UK has become one of the design communities of choice for the world – and the automotive market is a leading example.

Our Grand Prix winner this year – Romax Technology – has carved out for itself a leading position in the design of bearings and gearboxes. It now has more than 100 customers in the automotive industry and is involved with 14 of the top 15 manufacturers. That's a market which is one of the hardest to get involved in and which is fiercely competitive.

Romax' approach is something all companies should embrace. It looks to engineer a better world for its clients and customers; it puts innovation at the heart of everything it does; it looks for continuous improvement; and believes it can deliver value and build loyalty through long term partnerships.

This year, we had another 'dead heat' – this time for Design Engineer of the Year. Our winners come from opposite ends of the spectrum: one, the chief design engineer in a small, specialist company; the other is director of technology for a multinational IP developer.

Both, in their own ways, show what's great about UK design engineering.

Mike Franklin is passionate about innovation and believes there is always a better way of making things; particularly Crawley Creatures' animatronic products. Peter Greenhalgh, meanwhile, led a 50 person team designing the Cortex-A53 processor; ARM's first step into the 64bit market.

Please join me in congratulating everyone who entered this year's BEEAs and the winners in particular.

The drive for success

A specialism in powertrain design and development has made Romax one of the 'go to' consultancies for automotive companies.

The automotive industry is one of the most competitive there is. Manufacturers strive for an edge over each other and, when they find that edge, tend to guard it jealously. Any organisation that manages to do business with more than one manufacturer must have something special going for it. But when you find one consultancy working for more than 100 auto companies – and 14 of the top 15 car makers – then attention is focused.

Romax Technology is a global business headquartered in the UK. It offers consulting, software and design solutions, as well as support for bearings and gearboxes, to customers in markets ranging from automotive to wind energy.

Consulting services typically comprise around 40% of its annual business in terms of client engagements and revenue. This element of its business has grown by an average of 30% a year over the last five years.

Automotive is its strongest sector, with many recent consultancy projects analysing problems such as gear whine and gear rattle. It is also involved in the predictive analysis of noise, vibration and harshness of vehicle transmissions and in the development of next generation 9 and 10 speed automatic gearboxes, continuously variable transmissions and dual clutch transmissions. However, the business is growing from clients in the off highway and rail sectors.

Let's hear how the company explains this. "We have achieved this, in part, by growing and retaining a skills set that, we believe, is the envy of most of our clients. Clients look to Romax to help them to move from concept to production more quickly, reduce their design time and optimise development."

Romax is part of the EU funded ODIN project – Optimised Electric Drivetrain by Integration – which aims to develop a compact, cost effective and efficient powertrain for electric vehicles (EV).

The project emerged because the EU wants to stimulate growth in the EV market by reducing overall vehicle costs, achieved via the smarter integration of gearbox, motor and electronics, and without the use of permanent magnets.

However, the consortium was initially baffled by the range of options available. Romax helped to accelerate design and development by providing advice and support and by engaging with the consortium partners. By simulating the system dynamics early in the design process, Romax reduced predicted noise from the motor and gearbox by up to 24 dB.

"The objective was to create a compact drive without compromising on torque capability," says Barry James, Romax' chief technology officer. "As things become smaller and more power dense, it is essential to address component integration issues from the very first stages and validate your high speed concepts."

Looking to build on this strong base, the company now plans to more than double the number of staff at its

What the judges said:

"In order to work with I4 of the world's automotive giants, you have to be pretty good. To have tripled in size since 2009 shows true British Engineering Excellence."

Nottingham headquarters. A commitment to R&D is said to enable its staff to refresh and update their knowledge while creating new ideas and approaches. "As a world class engineering consultancy, we look at 'how things work' from multiple angles and challenge the status quo." Recognising this approach, the London Stock Exchange recently named Romax as one of the top 1000 British businesses for innovation.

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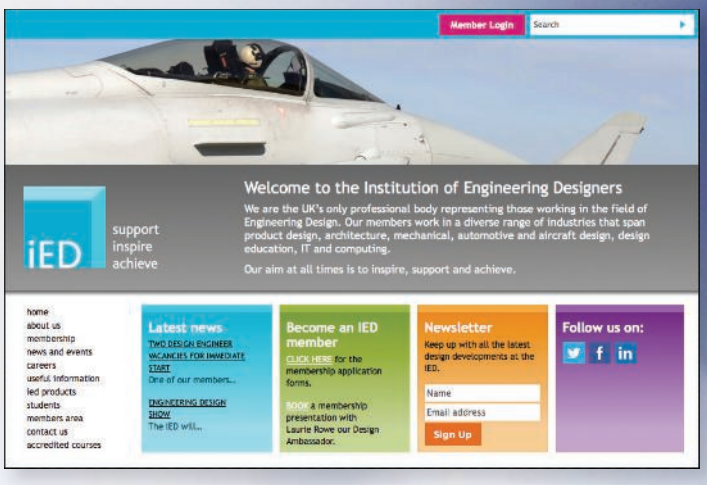

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Consultancy moves up a gear

A valuable resource for automotive companies from around the world

Consultancies come in a range of 'shapes and sizes'. There are big ones, small ones, specialists and generalists, so picking the Consultancy of the Year is a significant challenge for the Judging Panel.

Amongst the things the Judges were looking for were innovation, flexibility and the number of projects handled during the previous year. In addition, the Judges were interested in how the consultancy had developed over the past five years.

Five consultancies made the shortlist and their various strengths made for an interesting debate. But Romax attracted strong support, not only for the fact that it has, on average, grown by 30% a year over the last five years, but also because it has developed a reputation such that 14 of the world's top 15 automotive manufacturers use its specialist engineering consultancy, software and services.

Romax claims a thriving engineering consulting business covering design and development issues for gearbox and transmission. Typically, it handles more than 100 projects a year for a similar number of UK and international clients. This aspect of its business has grown threefold since 2009.

Automotive is the company's strongest sector, with a rapid increase in the number of consultancy projects analysing problems such as gear whine and gear rattle. It has also gained a reputation for the predictive analysis of noise, vibration and harshness of vehicle transmissions and for the development of the next generation of 9 and 10 speed automatic gearboxes, as well as continuously variable transmissions and dual clutch transmissions.

Further growth has come from the renewables sector, where Romax has become involved in the design, analysis and certification of wind turbine gearboxes, along with condition monitoring, and in the design analysis of transmissions for off highway and rail applications.

Now, the company plans to more than double the number of staff at its UK headquarters and R&D facility in Nottingham. It focus going forward is to continue investing in elements critical to its business and says that maintaining its competitive position is simply a by product of delivering

excellence in consulting services, with practical outcomes to projects that can deliver measurable value to clients.

Congratulations to Product Partners, whose entry was Highly Commended by the Judges

What the Judges said:

"A company that has grown significantly through a time of global upheaval in a challenging market sector by offering advanced engineering to some of the biggest automotive players."

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Getting the message across

Not only has this company pioneered RF technology, it is also promoting open systems in the sector

Entrants into the Small Company of the Year category are required to have fewer than 20 employees. You might think that narrows the field, but many of the UK's electronic and engineering companies are eligible.

This year, the Judges were looking for a company that could demonstrate a sound business plan, a product which meets a market need and the successful reception of that product. Beyond that, the Judges wanted to see evidence that the company was either taking on the 'big boys' or exploiting a viable market niche.

Lime Microsystems specialises in field programmable RF transceivers for next generation wireless broadband wireless systems. These transceivers can be software defined to be multi standard, multi frequency devices that enable manufacturers to address markets where frequency standards may not be in use.

Lime launched the first commercial chip in 2009. Until then, the solution either required multiple devices or devices only to be built for target markets with high volumes.

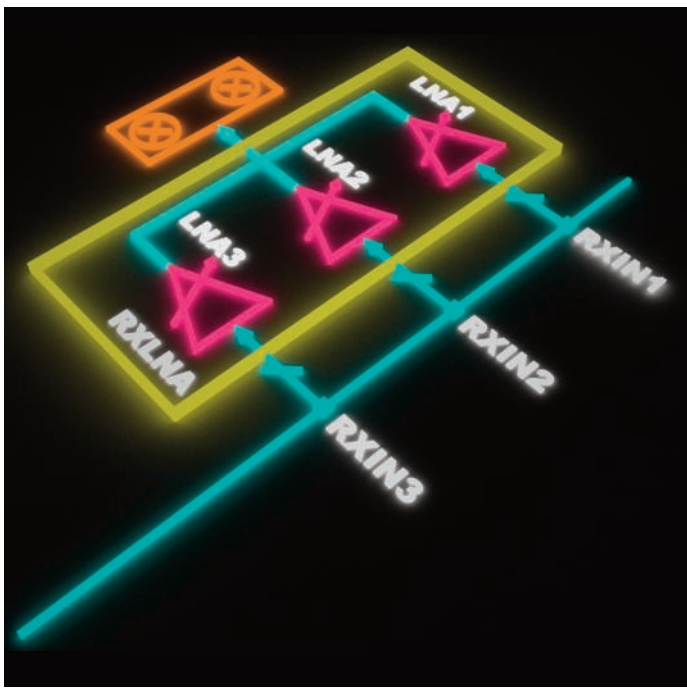
There was no commercial competition for some years until one other multinational company entered the market with a device providing only a subset of the functionality offered by Lime.

Lime says it continues to compete against this company by producing a more configurable device suitable for use by a broader customer base and by promoting its use through an industry movement.

Lime's technology has been adopted by more than 250 organisations for applications ranging from consumer communications equipment to software defined devices for use by the emergency services. Lime has also launched MyriadRF, an open source non profit project designed to enable the prototyping and creation of configurable wireless platforms. MyriadRF is now an independent organisation promoting open wireless systems.

The company has recently announced a significant deal with US semiconductor company Altera which includes: a strategic cooperation agreement; equity investment; marketing, sales and research collaboration; and reference designs for target applications.

Meanwhile, Lime says the LMS7002M is the world's most configurable transceiver, offering a high level of integration. It uses the latest CMOS technology to reduce cost and power consumption significantly and can run on any mobile communications standard and on any licensed and unlicensed frequency.



What the judges said:

"A small company that has shown impressive growth as well as a good plan for achieving more."

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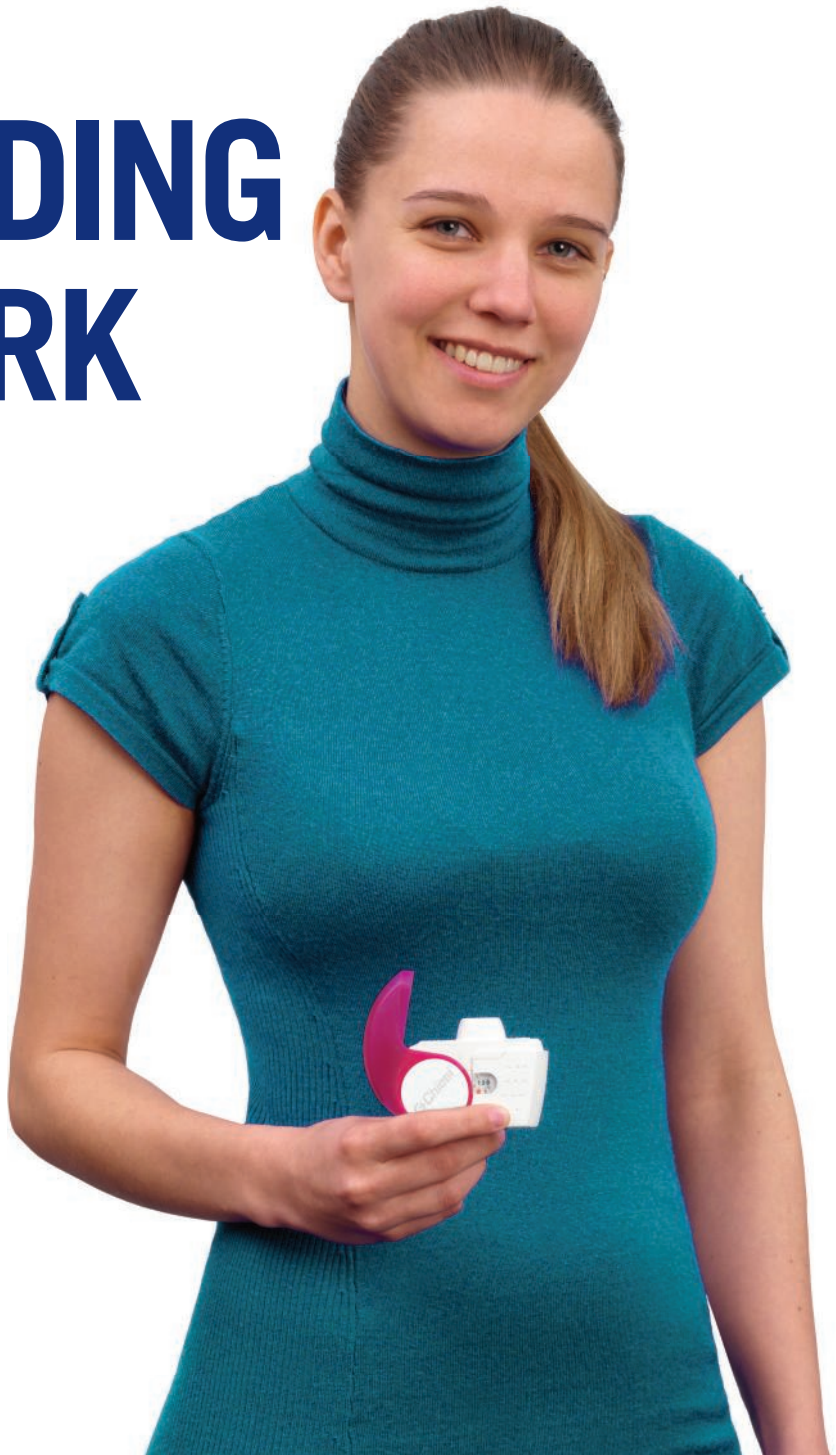

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The big sell

Our Start Up of the Year brings the wall mounted vending machine bang up to date

Start ups, we are told, are the future for the British economy. Established by entrepreneurs with an eye for a niche, such companies are being encouraged by the Government and a range of other organisations. But getting a start up off the ground and then growing it is a significant challenge.

For this category, the Judges were looking for a company established no earlier than 1 January 2010. It needs to show a sound business plan addressing a particular market need. Ideally, the Judges wanted to see orders or evidence of them.

Aeguana Digital was established in December 2012. The three energetic founders had previously been involved in the vending market and found it slow moving with little innovation and high costs; they set out to change things.

The result is Digital Vend, described as a machine that is cost effective, reliable and which provides real time data to the operator. A patented vend mechanism allows it to be adjusted to fit any small product, whilst users can engage with it via rich media digital ads. With support for a range of payment methods, Digital Vend is said to bring a significant uplift in sales, a reduction in service costs and new revenue streams. It also streamlines the logistics of running a vending operation, says the company.

Aeguana received £90,000 in seed funding in March 2013, which allowed the first prototype to be constructed within four months. A presentation to the UK's largest wall mounted vending operator resulted in an exclusive deal, with field trials suggesting a 700% increase in sales. The company is now looking to close a second funding round to allow markets outside of the UK to be addressed.

Innovations are said to have been made in all aspects of the design, bringing a interactive device which is radically different to older machines. Using Internet of Things technology, Digital Vend collects real time data and allows for content to be 'pushed' to it. Amongst the innovations is the use of a Raspberry Pi to ensure a low cost, yet powerful solution.

What the Judges said:

"They spotted an opportunity in an apparently staid market, took action and achieved a great deal in a very short time."

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Getting a grip

This team designed a system to hold 650tonne turbine piles in place in water up to 40m deep – and the project was delivered on time.

There are instances where great engineering design is accomplished by one person working alone. But the vast majority of engineering design is all about team work.

Once the project is won, the team has to be assembled, the milestones decided and the design delivered. Along the way, all manner of problems await and the the winner of the Design Team of the Year will have dealt with these problems efficiently whilst keeping the project on track.

The winning team from Houlder was charged by MPI Offshore with the development and supply of a pair of gripper arms that would allow offshore wind turbine piles to be maintained in position during installation. The arms needed to: aid the installation of piles in up to 40m of water; handle piles weighing up to 650tonne; and handle piles up to 65m long and 7m in diameter.

To do so, Houlder assembled a ten person team to deliver the design through all key milestones; from initial feasibility discussions to detailed engineering and to do so in less than 60 weeks; or 13,000 person hours.

"The challenge of handling offshore wind turbine piles has grown along with their size," commented project director Frederic Perdrix. "MPI's specific requirement was a great opportunity for our engineers to demonstrate their ingenuity and ambition. The result combines heavy duty structural, mechanical and hydraulic engineering with precision control."

Houlder's project team designed the arms from initial front end engineering design and product specification through to detailed engineering and fabrication.

Specific phases in the project included: a kickoff meeting and design basis; Concept Design; a proposal for design, manufacture and installation; followed by design, manufacture, installation and commissioning All four phases of activity were closely monitored against transparent quality and project plans.

The design team had to consider numerous innovative solutions to integration challenges, both between components and with ship deck features and systems.

The positioning of the arms below the vessel's stern was one innovative solution, minimising the amount of deck space required. Both arms can be controlled from an on deck console fitted with an XY joystick, emergency stop and one touch screen panel.

What the Judges said:

"A fantastic example of a huge, multidisciplinary project that meets a unique and demanding engineering challenge."."

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Cleaning up their act

Affordable solution promises to cut CO_2 emissions significantly

Designing to be 'green' is fast becoming a central part of an engineer's job function. Now, designs need not only to be made using the appropriate materials, but also to be recyclable at the end of life. Throw in some consideration of the device's carbon footprint and the challenge grows.

Controlled Power Technologies has addressed the need for greener automotive technology and developed technology which is applicable to car, bus and truck designs. Its LC Super Hybrid programme is set to bring what the company calls a 'substantial reduction' in CO_2 emissions for a price premium of around £750.

The LC Super Hybrid approach combines Valeo's electric supercharger and CPT's integrated starter-generator technologies. The result is said by CPT to enable aggressive downsizing and down speeding of existing engine families, delivering CO2 reduction and fuel economy improvement.

The 12V and 48V demonstrators are said to represent the culmination of more than two decades of research and development into lead carbon batteries and almost 15 years of research into switched reluctance motor generators.

Vehicle legislation is demanding major reduction in CO_2 emissions and less use of exotic materials. Currently, 95% of electric motors produced for the auto industry use rare earth permanent magnets. In a high voltage hybrid, the traction motor alone needs at least 1kg of neodymium, raising issues of availability, price volatility and end of life recyclability.

In switched reluctance machines, these magnets are replaced with electronic switches and software. Lead carbon batteries, meanwhile, will outlast the vehicle and are 100% recyclable. They also have simpler electronic and thermal management systems than NiMH and Li ion batteries.

Electric supercharging enables the 1.4litre engine in the demonstrator vehicles to be recalibrated, increasing power and torque. In the 12V demonstrator, 'diesel levels' of fuel economy are claimed with a 7% reduction in CO_2 emissions. Initial calibration of the 48V demonstrator suggests a 13% improvement may be possible.

These complementary technologies are now ready for high volume series production and the first vehicles featuring 'intelligent electrification' are expected to make their showroom debut from 2016 onwards.

What the Judges said:

"A real world solution to one of the world's biggest environmental issues: how to make clean electric motoring affordable and accessible."

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Polyamide performs perfectly

A custom designed polymer is ideal for application in electric power steering systems

Choosing the right material for the application can make or break the design – in more ways than one.

The worm wheel is a safety critical component in any electric power steering system. The whole system must resist high impacts, such as when a car is driven at speed into a high kerb, as well as coping with the total electric failure of the system. In these circumstances, the worm wheel should enable 'backdrive' to allow the driver to maintain vehicle control under all eventualities. Similarly, if the engine stalls, the electric power steering system should remain active.

The design brief for the worm wheel was developed internally, following approaches from a number of vehicle manufacturers looking to improve the design, performance and efficiency of the steering element.

Whilst the choice of materials was not constrained, the need for the product to be delivered in high volumes eliminated some highly engineered materials.

Nylacast, in association with customer design engineers, agreed minimum specifications for the worm wheel, including a factor of safety of at least 3:1. The material needed to demonstrate: high shock resistance; the ability to operate in temperatures ranging from -40 to 1200°C; low noise, vibration and harshness; the lowest possible friction; long operating life; and the ability to maintain a positive drive under any conditions

Nylacast's worm wheel is made from a combination of polymer and steel. The steel inner hub provides dimensional stability and strength, while the outer ring is made from a custom formulated grade of copolymer 6.12 developed by Nylacast's R&D department.

This outer ring allows the gear to have self lubrication properties when working alongside a mated steel worm, ensuring it runs smoothly. This custom formulated polyamide also offers high strength.

The polyamide is cast, rather than extruded or injection moulded, allowing a very accurate globoidal gear tooth profile to be specified. The casting process also employs double annealing, which delivers additional dimensional stability.

The project's objectives were to use Nylacast's materials and engineering expertise to meet specific challenges posed by the automotive industry. More than 11million devices are now deployed on 45 vehicle models around the world with no reported failures or defects having been reported.

What the Judges said:

"An impressive application of a polymer in a mass market context, the challenges of which required a very smart choice of materials."

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Making connections

Bluetooth based approach looks to bring the Internet of Things to home automation

There must be few people in UK industry who have yet to hear about the Internet of Things (IoT) and the benefits which are being claimed for novel communications technology.

Many companies are now developing products for use on the IoT, but one area where opportunities are envisaged is in the home, using mobile devices as the control element. However, consumers are worried about having to buy systems, rather than being able to connect devices as necessary.

One way to avoid this is to use an open communication protocol and CSR has exploited its expertise in Bluetooth to develop CSRmesh. This wireless mesh technology takes advantage of Bluetooth to allow a system to be configured and controlled. Bluetooth Smart enabled devices – such as sensors, lamps, doors and white goods – can then be linked together and controlled from, for example, a mobile phone.

Highlighting the potential, CSR estimates the market for such systems to be worth in excess of $300billion by 2020.

CSR says CSRmesh differs significantly from other solutions in that it doesn't entail a complex set up process or any kind of home gateway. It also allows direct control from anywhere in a house. The system has been designed to be secure and for the level of security to be upgraded as new algorithms emerge.

CSRmesh is a protocol layer that runs on top of the Bluetooth 4.0 standard. It is supported on single mode Bluetooth Smart devices, as well as dual mode Bluetooth Smart Ready devices. By using the existing Bluetooth standard, it enables consumer products to interact directly with devices within the network.

Developed initially to support wireless lighting control, the CSRmesh protocol also supports models for additional applications. Full home automation models enabling heating, ventilation and air conditioning, as well as security and sensing, will be launched in the future.

Samsung, along with two other Tier One manufacturers, has selected the technology and will ramp mass production of smart lighting solutions based on the CSRmesh solution later this year. Meanwhile, CSR has launched a Developer's Kit with example applications to accelerate the introduction of low power connected IoT products.

What the Judges said:

"A bold innovation that makes a serious play for a vast and highly competitive market."

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Improving the world through engineering

Digging for the future

As offshore wind energy sites develop, this crawler is up to the challenge of burying the cables

Mechanical products come in all shapes and sizes, but IHC's Hi-Traq subsea crawler vehicle is big. And the design challenges involved were equally large.

Hi-Traq provides the ability to ensure safe burial of interarray cables for the offshore renewables industry through the use of an innovative self levelling system controlling four, independently driven track undercarriages. As Hi-Traq has the capacity for short radius trenching, the vehicle can reverse up to the base of a turbine and begin operations from the cable exit.

Using a four track system offers improved traction on the seabed in shallow water. The environment found at offshore renewable locations required a manoeuvrable system, which mandated a chassis from which a variety of subsea tasks can be conducted. Hi-Traq is scalable, providing the opportunity to address applications ranging from interarray trenching to heavy oil and gas subsea decommissioning.

Having analysed available trenching technologies, IHC determined a dedicated subsea crawler would be the best solution for interarray cable burial. A four track crawler system would provide better manoeuvrability than two track, skid-steer vehicles, while its patent pending levelling system enables vertical trenches to be cut whilst the device is trenching on slopes of up to 20°. Meanwhile, equipment currently used for decommissioning tends to be versions of conventional onshore excavators adapted for use at sea.

The non parallel wishbone levelling geometry for the vehicle was designed to keep the virtual pivot point at the ground-to-cutter interface, which enables the vehicle to cut a constant depth trench on side slopes. The vehicle also has a patented tilting function allowing it to trench around a radius, and to avoid undercutting the outside trench wall.

IHC is looking to use the Hi-Traq chassis as a platform for peripheral tooling; it provides better manoeuvrability and a more stable operating platform, while the four track system allows operation in soft soils.

The independent steering system supports crab, skid and wagon steering. This, in turn, enables the small radius trenching required for trenching inter array cables as they leave a turbine.

Hi-Traq has the capacity to stay on station in the high currents and wave action found at offshore renewable locations and so reduces operational downtime associated with conventional equipment.

IHC MERWEDE

IHC Engineering Business Ltd

What the Judges said:

"A world first turnkey project that met all customer requirements in an extremely challenging environment."

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Appealing to the crowd

A crowd funded open source design for a 3D printable prosthetic hand could be the start of a global network of micro manufacturing sites

The last few years have seen many people and organisations worry about the future of the UK's engineering sector. A decline in the number of students enrolling on engineering courses has been interpreted as potentially bringing problems in the future. While the trend appears to have reversed recently, quality graduates are emerging from UK universities.

The Young Engineer of the Year Award was of great interest to the Judges. They were looking who has 'hit the ground running'; someone who has applied knowledge and innovation to projects, who is motivated and who is acting as an ambassador for their chosen profession.

Joel Gibbard's interest in robotics moved him to want portray the technology as something to 'revere, rather than fear'. In his final year project for his Honours Degree in Robotics at the University of Plymouth, he designed a low cost prosthetic hand, something which his professors said would not be achievable in two university semesters. But he proved them wrong, creating a fully functional

prototype that has already won three awards.

Joel, the man behind the Open Hand Project, is creating Dextrus; something intended to replicate much of the functionality of the human hand. With electric motors instead of muscles, steel cables instead of tendons and a rubber coating for skin, the hand integrates 3D printed plastic parts that work like bones.

But Dextrus is not being developed for Joel's gain; instead, he is creating Dextrus as an open source project; all the information needed to create one is posted on the Open Hand Project's website. Not only will this make the hand more widely available, it will also allow the design to be improved as users feed back their experiences.

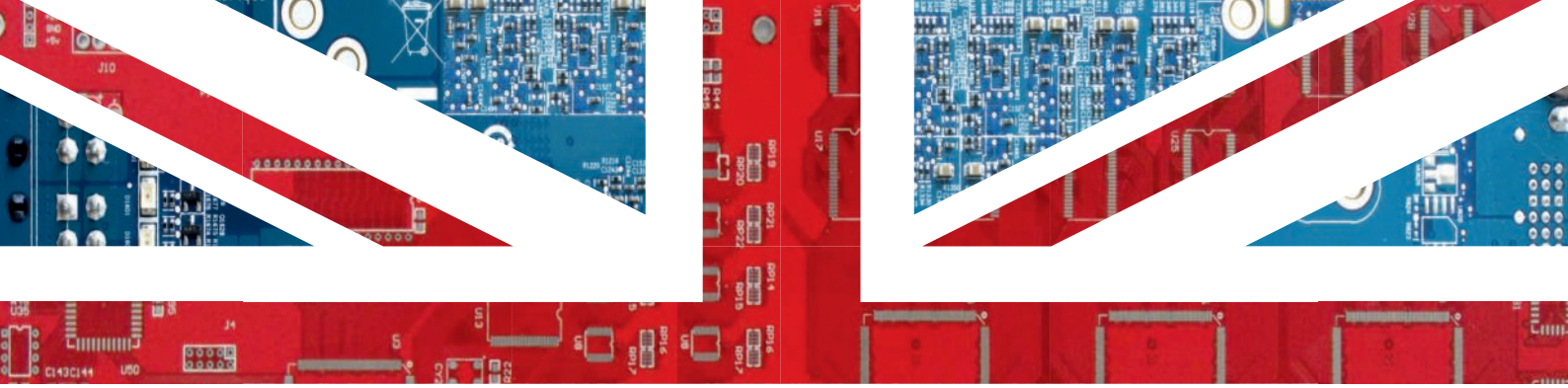
Still in his early 20s, Joel is passionate about the project. Supported by National Instruments, he has made a TED talk and has promoted Dextrus and the Open Hand Project through a range of publications. He thinks this highlights how an engineer with a good idea can singlehandedly make the world a better place.

In the future, he hopes to establish a network of micro manufacturing sites that can build and distribute prosthetics around the world, boosting local economies.

Congratulations to Matti Coleman, whose entry was Highly Commended by the Judges

What the Judges said:

"A highly motivated, dedicated young engineer with multidisciplinary skills and an impressive record of achievement already."



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Design Engineer of the Year

Animatronic achievements

Bringing innovation to bear whilst working to a tight budget

Any entry for a competition for a design engineer of the year which includes the phrase 'at the age of 14, Mike had already built his first jet engine and scorched the family lawn' is likely to have a favourable reception from a panel of engineers.

And so it was for Mike Franklin, a joint winner of this year's Design Engineer of the Year Award. But the ability to scorch a lawn is but one requirement. We were also looking for engineers who produced innovative designs within strict commercial limits and those who have also put something back into their profession.

Each project at Crawley Creatures requires a bespoke solution, allowing Mike to draw on his electromechanical, software and mechatronic knowledge.

He sees the objective clearly and excels in designing and manufacturing an end product that not only meets the client's needs, but also exceeds expectations in terms of cost, efficiency, durability and sustainability.

His expertise ranges from designing animatronic prehistoric creatures for the Natural History Museum to bespoke military test platforms.

Mike works on the whole project, rather than certain aspects. In this way, he can lead other team members more effectively. With an innovative approach to problem solving, he can evaluate and reevaluate throughout the design's life. As a fully qualified tool maker, Mike can also machine and assemble the components – he believes that being able to make components gives him a greater understanding of the whole manufacturing process and that a simple change to a component may greatly improve the ease of manufacture.

Mike is outward and enthusiastic in his approach to design engineering and keen to share his knowledge base internationally, nationally and on a local level.

Funded by the BBC and NESTA, Mike spent three months working with secondary school children to design and build robots. Along with Professor Noel Sharkey and three design engineers, Mike travelled to Beijing on behalf of the British Council, looking to promote British innovation and design by teaching people in China how to build low cost robots. On a local level, Mike has held various 'Show and Tell' talks with Scouts and Youth Groups in Northamptonshire about robotics and design engineering.

Whilst designing is his work, it is also his hobby. In 2005, he claimed the World Record for the fastest walking robot with Scuttle, an eight legged device.

What the Judges said:

"Achieving deep innovation using creativity, originality and ingenuity – all while working with limited resources and to extremely tight deadlines."

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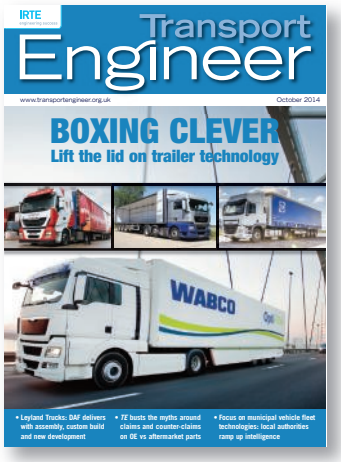

Passionate about engineering

Core to the company's success

Team leader takes ARM into a new area of technology

On its own, a processor core may not seem that important. However, when the applications for that core are considered, its role comes into sharp focus.

ARM is renowned for its origins in a converted chicken shed in Cambridge. From that humble start, it has grown to be one of the most important developers of intellectual property. And amongst the IP on its portfolio are the big.LITTLE configuration and the ARM Cortex-A53, the company's first 64bit processor. The development of both products was led by Peter Greenhalgh, a 13 year company veteran.

ARM has built its reputation on developing processors for use in mobile phones. As these phones get more complex, designers are under growing pressure to reduce power consumption so that users get the battery life they expect. ARM's big.LITTLE approach enables SoCs for mobile products to meet both needs. In fact, the latest big.LITTLE software and platforms can save 75% of CPU energy in low to moderate demand applications, whilst increasing performance by 40% for more demanding workloads. In developing big.LITTLE, Peter led a team of 50 engineers over three years.

Meanwhile, the Cortex-A53 processor has been designed to be a power efficient device, capable of supporting 32bit and 64bit code. Not only is it suited for use in smartphones, it is also being considered by a number of developers for use in data centres. Here, because the device offers greater performance for lower power consumption, it may well make a significant to the overall efficiency of the data centre.

The big.LITTLE and the Cortex-A53 projects were led by Peter from the initial design stage to verification and implementation. Both are said to have made a significant contribution to ARM's leadership in low power product designs.

Peter acts as a mentor to several junior engineering leads in ARM, helping to develop their skill sets and to ensure the next generation of ARM engineers is equipped to deliver the technology expected by customers. Alongside mentoring, Peter runs training courses to promote best practice engineering approaches and the lessons learned by ARM. He is also an active voice in the wider ARM ecosystem and industry.

What the Judges said:

"A leading creative force behind one of the world's – let alone the UK's – great design engineering success stories."

Andrew Burrows, chairman
Winner of the 2009 BEEAs Grand Prix, Andrew set up i20 Water in 2005 in order to develop technology that would reduce leakage and burst frequency on water distribution networks.
Previously, he was a pilot in the RAF and was appointed technical director for Seldén, the world's largest manufacturer of yacht masts. He has also led multidisciplinary design teams in the aerospace and marine industries.

Ashley Evans
Ashley Evans, director of electronics with techUK, started his career at British Aerospace, then worked in a number of sectors. Most recently chief executive of the Electronics Technology Network, Ashley was previously chief executive of Electronics Scotland and inaugural chair of the UK Electronics Alliance.

Phil Mayo
Phil founded Premier EDA Solutions and is a visiting industrial fellow at the University of Hertfordshire and a member of the University's Industrial Advisory Group and Industrial Certification Committee.
Committed to the success of the UK electronics industry, Phil believes engineering skills should be high on the list of national priorities.

Philippa Oldham
A chartered mechanical engineer, 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.
In May 2011, Philippa moved to her current role as head of transport and manufacturing with the IMechE.

Dr Andy Sellars
Dr Andy Sellars completed an industrially funded PhD at Strathclyde University, then joined Rolls-Royce Industrial Power Group. Following a brief period at Strathclyde University, he joined Spirent Communications, where he developed electronic instruments, and Electron Tubes. More recently, he has worked as an independent consultant and as lead technologist for high value manufacturing with innovateUK.

Justin Cunningham
Justin has a first class honours degree in Aerospace Engineering and spent 15 months following graduation with Astrium Space, working on future concepts of spacecraft. Since then, he has been worked as a technical journalist and is currently editor of *Engineering Materials* and deputy editor of *Eureka*.

Paul Fanning
Paul Fanning has been a trade and technical journalist for more than 15 years. Having started his career with Machinery & Production Engineering, he has gone on to edit a number of industrial titles and took over as editor of Eureka in January 2010.

Sebastien Cuvellier-Mousellien
Design Engineer of the Year and the overall Grand Prix prize winner at the 2013 BEEAs, Sebastien worked at Team Consulting as a senior engineering consultant for five years, during which time he established an international reputation for designing robust and capable medical devices.
He is now an independent consultant developing medical smartphone and tablet applications.

Graham Pitcher
An engineer by training, Graham has covered developments in the electronics industry for more than 30 years. He also has expertise in computer aided design, industrial automation and computing technologies. For the past 20 years, he has been involved with the development of *New Electronics* and has edited the magazine for more than 15 years. He is also group editor of Findlay Media's Engineering Design Division.

Eric Wilkinson
Chief operating officer for 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

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"This year, we had another 'dead heat' — this time for Design Engineer of the Year. Both, in their own ways, show what's great about UK design engineering."

Graham Pitcher,

Group Editor,

Findlay Media

Engineering Design Division

Graham Pitcher
Group Editor, Findlay Media
Engineering Design Division

Into the fast lane

UK design companies are stepping up to help the automotive industry solve some of its challenges.

"Almost in stealth mode, the UK has become one of the design communities of choice for the world — and the automotive market is a leading example."

A lot of noise has been made of the decline in the UK's manufacturing capability. Whilst it is undoubtedly true that the UK isn't making as much as it used to, it remains the world's fifth largest manufacturing economy.

Less attention has been paid to the UK's design sector; something which makes a substantial contribution to the nation's GDP. Almost in stealth mode, the UK has become one of the design communities of choice for the world – and the automotive market is a leading example.

Our Grand Prix winner this year – Romax Technology – has carved out for itself a leading position in the design of bearings and gearboxes. It now has more than 100 customers in the automotive industry and is involved with 14 of the top 15 manufacturers. That's a market which is one of the hardest to get involved in and which is fiercely competitive.

Romax' approach is something all companies should embrace. It looks to engineer a better world for its clients and customers; it puts innovation at the heart of everything it does; it looks for continuous improvement; and believes it can deliver value and build loyalty through long term partnerships.

This year, we had another 'dead heat' – this time for Design Engineer of the Year. Our winners come from opposite ends of the spectrum: one, the chief design engineer in a small, specialist company; the other is director of technology for a multinational IP developer.

Both, in their own ways, show what's great about UK design engineering.

Mike Franklin is passionate about innovation and believes there is always a better way of making things; particularly Crawley Creatures' animatronic products. Peter Greenhalgh, meanwhile, led a 50 person team designing the Cortex-A53 processor; ARM's first step into the 64bit market.

Please join me in congratulating everyone who entered this year's BEEAs and the winners in particular.

The drive for success

A specialism in powertrain design and development has made Romax one of the 'go to' consultancies for automotive companies.

The automotive industry is one of the most competitive there is. Manufacturers strive for an edge over each other and, when they find that edge, tend to guard it jealously. Any organisation that manages to do business with more than one manufacturer must have something special going for it. But when you find one consultancy working for more than 100 auto companies – and 14 of the top 15 car makers – then attention is focused.

Romax Technology is a global business headquartered in the UK. It offers consulting, software and design solutions, as well as support for bearings and gearboxes, to customers in markets ranging from automotive to wind energy.

Consulting services typically comprise around 40% of its annual business in terms of client engagements and revenue. This element of its business has grown by an average of 30% a year over the last five years.

Automotive is its strongest sector, with many recent consultancy projects analysing problems such as gear whine and gear rattle. It is also involved in the predictive analysis of noise, vibration and harshness of vehicle transmissions and in the development of next generation 9 and 10 speed automatic gearboxes, continuously variable transmissions and dual clutch transmissions. However, the business is growing from clients in the off highway and rail sectors.

Let's hear how the company explains this. "We have achieved this, in part, by growing and retaining a skills set that, we believe, is the envy of most of our clients. Clients look to Romax to help them to move from concept to production more quickly, reduce their design time and optimise development."

Romax is part of the EU funded ODIN project – Optimised Electric Drivetrain by Integration – which aims to develop a compact, cost effective and efficient powertrain for electric vehicles (EV).

The project emerged because the EU wants to stimulate growth in the EV market by reducing overall vehicle costs, achieved via the smarter integration of gearbox, motor and electronics, and without the use of permanent magnets.

However, the consortium was initially baffled by the range of options available. Romax helped to accelerate design and development by providing advice and support and by engaging with the consortium partners. By simulating the system dynamics early in the design process, Romax reduced predicted noise from the motor and gearbox by up to 24 dB.

"The objective was to create a compact drive without compromising on torque capability," says Barry James, Romax' chief technology officer. "As things become smaller and more power dense, it is essential to address component integration issues from the very first stages and validate your high speed concepts."

Looking to build on this strong base, the company now plans to more than double the number of staff at its

What the judges said:

"In order to work with I4 of the world's automotive giants, you have to be pretty good. To have tripled in size since 2009 shows true British Engineering Excellence."

Nottingham headquarters. A commitment to R&D is said to enable its staff to refresh and update their knowledge while creating new ideas and approaches. "As a world class engineering consultancy, we look at 'how things work' from multiple angles and challenge the status quo." Recognising this approach, the London Stock Exchange recently named Romax as one of the top 1000 British businesses for innovation.

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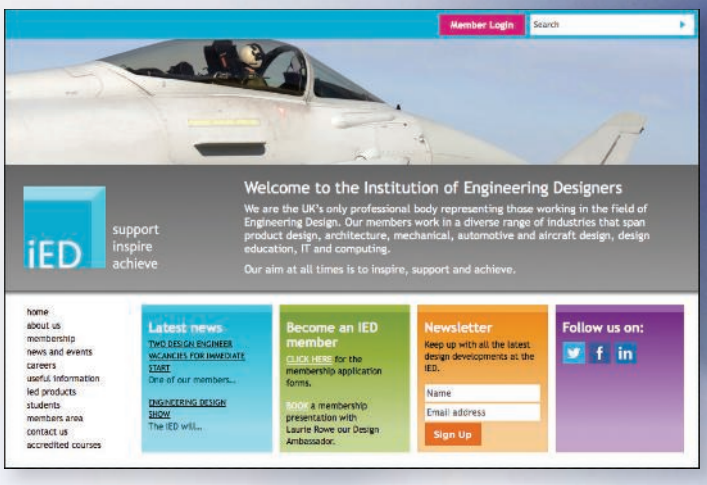

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Consultancy moves up a gear

A valuable resource for automotive companies from around the world

Consultancies come in a range of 'shapes and sizes'. There are big ones, small ones, specialists and generalists, so picking the Consultancy of the Year is a significant challenge for the Judging Panel.

Amongst the things the Judges were looking for were innovation, flexibility and the number of projects handled during the previous year. In addition, the Judges were interested in how the consultancy had developed over the past five years.

Five consultancies made the shortlist and their various strengths made for an interesting debate. But Romax attracted strong support, not only for the fact that it has, on average, grown by 30% a year over the last five years, but also because it has developed a reputation such that 14 of the world's top 15 automotive manufacturers use its specialist engineering consultancy, software and services.

Romax claims a thriving engineering consulting business covering design and development issues for gearbox and transmission. Typically, it handles more than 100 projects a year for a similar number of UK and international clients. This aspect of its business has grown threefold since 2009.

Automotive is the company's strongest sector, with a rapid increase in the number of consultancy projects analysing problems such as gear whine and gear rattle. It has also gained a reputation for the predictive analysis of noise, vibration and harshness of vehicle transmissions and for the development of the next generation of 9 and 10 speed automatic gearboxes, as well as continuously variable transmissions and dual clutch transmissions.

Further growth has come from the renewables sector, where Romax has become involved in the design, analysis and certification of wind turbine gearboxes, along with condition monitoring, and in the design analysis of transmissions for off highway and rail applications.

Now, the company plans to more than double the number of staff at its UK headquarters and R&D facility in Nottingham. It focus going forward is to continue investing in elements critical to its business and says that maintaining its competitive position is simply a by product of delivering

excellence in consulting services, with practical outcomes to projects that can deliver measurable value to clients.

Congratulations to Product Partners, whose entry was Highly Commended by the Judges

What the Judges said:

"A company that has grown significantly through a time of global upheaval in a challenging market sector by offering advanced engineering to some of the biggest automotive players."

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Romax TECHNOLOGY

Getting the message across

Not only has this company pioneered RF technology, it is also promoting open systems in the sector

Entrants into the Small Company of the Year category are required to have fewer than 20 employees. You might think that narrows the field, but many of the UK's electronic and engineering companies are eligible.

This year, the Judges were looking for a company that could demonstrate a sound business plan, a product which meets a market need and the successful reception of that product. Beyond that, the Judges wanted to see evidence that the company was either taking on the 'big boys' or exploiting a viable market niche.

Lime Microsystems specialises in field programmable RF transceivers for next generation wireless broadband wireless systems. These transceivers can be software defined to be multi standard, multi frequency devices that enable manufacturers to address markets where frequency standards may not be in use.

Lime launched the first commercial chip in 2009. Until then, the solution either required multiple devices or devices only to be built for target markets with high volumes.

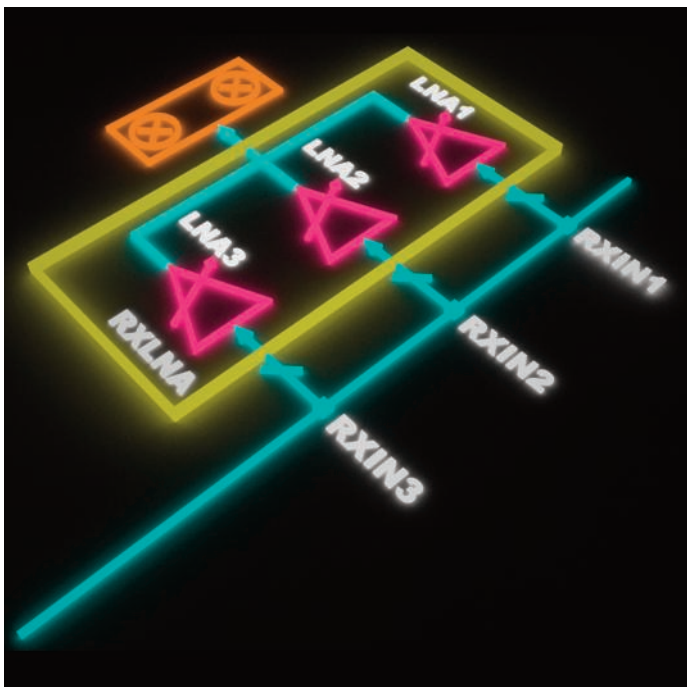
There was no commercial competition for some years until one other multinational company entered the market with a device providing only a subset of the functionality offered by Lime.

Lime says it continues to compete against this company by producing a more configurable device suitable for use by a broader customer base and by promoting its use through an industry movement.

Lime's technology has been adopted by more than 250 organisations for applications ranging from consumer communications equipment to software defined devices for use by the emergency services. Lime has also launched MyriadRF, an open source non profit project designed to enable the prototyping and creation of configurable wireless platforms. MyriadRF is now an independent organisation promoting open wireless systems.

The company has recently announced a significant deal with US semiconductor company Altera which includes: a strategic cooperation agreement; equity investment; marketing, sales and research collaboration; and reference designs for target applications.

Meanwhile, Lime says the LMS7002M is the world's most configurable transceiver, offering a high level of integration. It uses the latest CMOS technology to reduce cost and power consumption significantly and can run on any mobile communications standard and on any licensed and unlicensed frequency.



What the judges said:

"A small company that has shown impressive growth as well as a good plan for achieving more."

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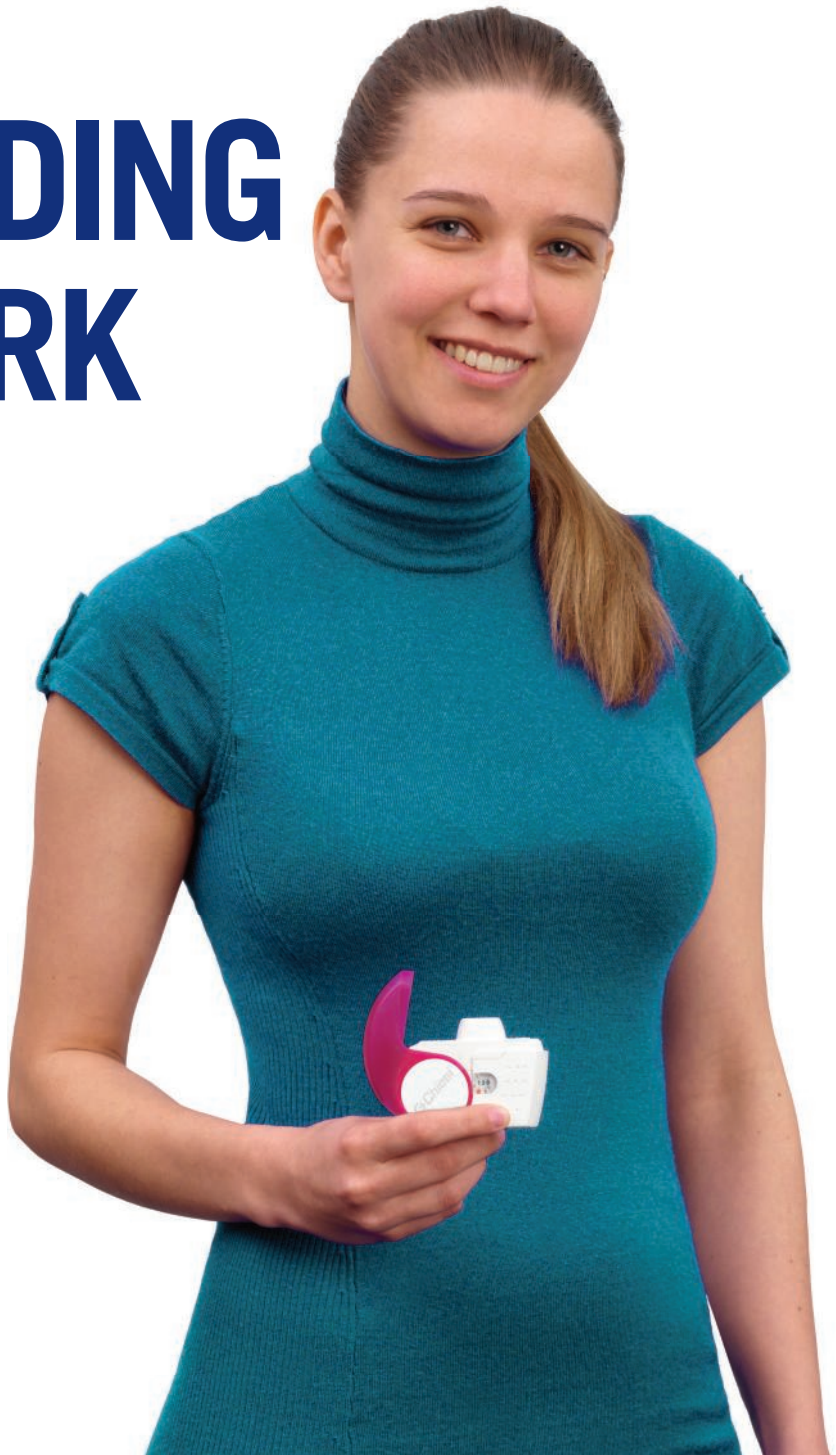

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THE QUEEN'S AWARDS FOR ENTERPRISE: INNOVATION 2013

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The big sell

Our Start Up of the Year brings the wall mounted vending machine bang up to date

Start ups, we are told, are the future for the British economy. Established by entrepreneurs with an eye for a niche, such companies are being encouraged by the Government and a range of other organisations. But getting a start up off the ground and then growing it is a significant challenge.

For this category, the Judges were looking for a company established no earlier than 1 January 2010. It needs to show a sound business plan addressing a particular market need. Ideally, the Judges wanted to see orders or evidence of them.

Aeguana Digital was established in December 2012. The three energetic founders had previously been involved in the vending market and found it slow moving with little innovation and high costs; they set out to change things.

The result is Digital Vend, described as a machine that is cost effective, reliable and which provides real time data to the operator. A patented vend mechanism allows it to be adjusted to fit any small product, whilst users can engage with it via rich media digital ads. With support for a range of payment methods, Digital Vend is said to bring a significant uplift in sales, a reduction in service costs and new revenue streams. It also streamlines the logistics of running a vending operation, says the company.

Aeguana received £90,000 in seed funding in March 2013, which allowed the first prototype to be constructed within four months. A presentation to the UK's largest wall mounted vending operator resulted in an exclusive deal, with field trials suggesting a 700% increase in sales. The company is now looking to close a second funding round to allow markets outside of the UK to be addressed.

Innovations are said to have been made in all aspects of the design, bringing a interactive device which is radically different to older machines. Using Internet of Things technology, Digital Vend collects real time data and allows for content to be 'pushed' to it. Amongst the innovations is the use of a Raspberry Pi to ensure a low cost, yet powerful solution.

What the Judges said:

"They spotted an opportunity in an apparently staid market, took action and achieved a great deal in a very short time."

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Getting a grip

This team designed a system to hold 650tonne turbine piles in place in water up to 40m deep – and the project was delivered on time.

There are instances where great engineering design is accomplished by one person working alone. But the vast majority of engineering design is all about team work.

Once the project is won, the team has to be assembled, the milestones decided and the design delivered. Along the way, all manner of problems await and the the winner of the Design Team of the Year will have dealt with these problems efficiently whilst keeping the project on track.

The winning team from Houlder was charged by MPI Offshore with the development and supply of a pair of gripper arms that would allow offshore wind turbine piles to be maintained in position during installation. The arms needed to: aid the installation of piles in up to 40m of water; handle piles weighing up to 650tonne; and handle piles up to 65m long and 7m in diameter.

To do so, Houlder assembled a ten person team to deliver the design through all key milestones; from initial feasibility discussions to detailed engineering and to do so in less than 60 weeks; or 13,000 person hours.

"The challenge of handling offshore wind turbine piles has grown along with their size," commented project director Frederic Perdrix. "MPI's specific requirement was a great opportunity for our engineers to demonstrate their ingenuity and ambition. The result combines heavy duty structural, mechanical and hydraulic engineering with precision control."

Houlder's project team designed the arms from initial front end engineering design and product specification through to detailed engineering and fabrication.

Specific phases in the project included: a kickoff meeting and design basis; Concept Design; a proposal for design, manufacture and installation; followed by design, manufacture, installation and commissioning All four phases of activity were closely monitored against transparent quality and project plans.

The design team had to consider numerous innovative solutions to integration challenges, both between components and with ship deck features and systems.

The positioning of the arms below the vessel's stern was one innovative solution, minimising the amount of deck space required. Both arms can be controlled from an on deck console fitted with an XY joystick, emergency stop and one touch screen panel.

What the Judges said:

"A fantastic example of a huge, multidisciplinary project that meets a unique and demanding engineering challenge."."

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HOULDER

Cleaning up their act

Affordable solution promises to cut CO_2 emissions significantly

Designing to be 'green' is fast becoming a central part of an engineer's job function. Now, designs need not only to be made using the appropriate materials, but also to be recyclable at the end of life. Throw in some consideration of the device's carbon footprint and the challenge grows.

Controlled Power Technologies has addressed the need for greener automotive technology and developed technology which is applicable to car, bus and truck designs. Its LC Super Hybrid programme is set to bring what the company calls a 'substantial reduction' in CO_2 emissions for a price premium of around £750.

The LC Super Hybrid approach combines Valeo's electric supercharger and CPT's integrated starter-generator technologies. The result is said by CPT to enable aggressive downsizing and down speeding of existing engine families, delivering CO2 reduction and fuel economy improvement.

The 12V and 48V demonstrators are said to represent the culmination of more than two decades of research and development into lead carbon batteries and almost 15 years of research into switched reluctance motor generators.

Vehicle legislation is demanding major reduction in CO_2 emissions and less use of exotic materials. Currently, 95% of electric motors produced for the auto industry use rare earth permanent magnets. In a high voltage hybrid, the traction motor alone needs at least 1kg of neodymium, raising issues of availability, price volatility and end of life recyclability.

In switched reluctance machines, these magnets are replaced with electronic switches and software. Lead carbon batteries, meanwhile, will outlast the vehicle and are 100% recyclable. They also have simpler electronic and thermal management systems than NiMH and Li ion batteries.

Electric supercharging enables the 1.4litre engine in the demonstrator vehicles to be recalibrated, increasing power and torque. In the 12V demonstrator, 'diesel levels' of fuel economy are claimed with a 7% reduction in CO_2 emissions. Initial calibration of the 48V demonstrator suggests a 13% improvement may be possible.

These complementary technologies are now ready for high volume series production and the first vehicles featuring 'intelligent electrification' are expected to make their showroom debut from 2016 onwards.

What the Judges said:

"A real world solution to one of the world's biggest environmental issues: how to make clean electric motoring affordable and accessible."

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Polyamide performs perfectly

A custom designed polymer is ideal for application in electric power steering systems

Choosing the right material for the application can make or break the design – in more ways than one.

The worm wheel is a safety critical component in any electric power steering system. The whole system must resist high impacts, such as when a car is driven at speed into a high kerb, as well as coping with the total electric failure of the system. In these circumstances, the worm wheel should enable 'backdrive' to allow the driver to maintain vehicle control under all eventualities. Similarly, if the engine stalls, the electric power steering system should remain active.

The design brief for the worm wheel was developed internally, following approaches from a number of vehicle manufacturers looking to improve the design, performance and efficiency of the steering element.

Whilst the choice of materials was not constrained, the need for the product to be delivered in high volumes eliminated some highly engineered materials.

Nylacast, in association with customer design engineers, agreed minimum specifications for the worm wheel, including a factor of safety of at least 3:1. The material needed to demonstrate: high shock resistance; the ability to operate in temperatures ranging from -40 to 1200°C; low noise, vibration and harshness; the lowest possible friction; long operating life; and the ability to maintain a positive drive under any conditions

Nylacast's worm wheel is made from a combination of polymer and steel. The steel inner hub provides dimensional stability and strength, while the outer ring is made from a custom formulated grade of copolymer 6.12 developed by Nylacast's R&D department.

This outer ring allows the gear to have self lubrication properties when working alongside a mated steel worm, ensuring it runs smoothly. This custom formulated polyamide also offers high strength.

The polyamide is cast, rather than extruded or injection moulded, allowing a very accurate globoidal gear tooth profile to be specified. The casting process also employs double annealing, which delivers additional dimensional stability.

The project's objectives were to use Nylacast's materials and engineering expertise to meet specific challenges posed by the automotive industry. More than 11million devices are now deployed on 45 vehicle models around the world with no reported failures or defects having been reported.

What the Judges said:

"An impressive application of a polymer in a mass market context, the challenges of which required a very smart choice of materials."

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Making connections

Bluetooth based approach looks to bring the Internet of Things to home automation

There must be few people in UK industry who have yet to hear about the Internet of Things (IoT) and the benefits which are being claimed for novel communications technology.

Many companies are now developing products for use on the IoT, but one area where opportunities are envisaged is in the home, using mobile devices as the control element. However, consumers are worried about having to buy systems, rather than being able to connect devices as necessary.

One way to avoid this is to use an open communication protocol and CSR has exploited its expertise in Bluetooth to develop CSRmesh. This wireless mesh technology takes advantage of Bluetooth to allow a system to be configured and controlled. Bluetooth Smart enabled devices – such as sensors, lamps, doors and white goods – can then be linked together and controlled from, for example, a mobile phone.

Highlighting the potential, CSR estimates the market for such systems to be worth in excess of $300billion by 2020.

CSR says CSRmesh differs significantly from other solutions in that it doesn't entail a complex set up process or any kind of home gateway. It also allows direct control from anywhere in a house. The system has been designed to be secure and for the level of security to be upgraded as new algorithms emerge.

CSRmesh is a protocol layer that runs on top of the Bluetooth 4.0 standard. It is supported on single mode Bluetooth Smart devices, as well as dual mode Bluetooth Smart Ready devices. By using the existing Bluetooth standard, it enables consumer products to interact directly with devices within the network.

Developed initially to support wireless lighting control, the CSRmesh protocol also supports models for additional applications. Full home automation models enabling heating, ventilation and air conditioning, as well as security and sensing, will be launched in the future.

Samsung, along with two other Tier One manufacturers, has selected the technology and will ramp mass production of smart lighting solutions based on the CSRmesh solution later this year. Meanwhile, CSR has launched a Developer's Kit with example applications to accelerate the introduction of low power connected IoT products.

What the Judges said:

"A bold innovation that makes a serious play for a vast and highly competitive market."

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Digging for the future

As offshore wind energy sites develop, this crawler is up to the challenge of burying the cables

Mechanical products come in all shapes and sizes, but IHC's Hi-Traq subsea crawler vehicle is big. And the design challenges involved were equally large.

Hi-Traq provides the ability to ensure safe burial of interarray cables for the offshore renewables industry through the use of an innovative self levelling system controlling four, independently driven track undercarriages. As Hi-Traq has the capacity for short radius trenching, the vehicle can reverse up to the base of a turbine and begin operations from the cable exit.

Using a four track system offers improved traction on the seabed in shallow water. The environment found at offshore renewable locations required a manoeuvrable system, which mandated a chassis from which a variety of subsea tasks can be conducted. Hi-Traq is scalable, providing the opportunity to address applications ranging from interarray trenching to heavy oil and gas subsea decommissioning.

Having analysed available trenching technologies, IHC determined a dedicated subsea crawler would be the best solution for interarray cable burial. A four track crawler system would provide better manoeuvrability than two track, skid-steer vehicles, while its patent pending levelling system enables vertical trenches to be cut whilst the device is trenching on slopes of up to 20°. Meanwhile, equipment currently used for decommissioning tends to be versions of conventional onshore excavators adapted for use at sea.

The non parallel wishbone levelling geometry for the vehicle was designed to keep the virtual pivot point at the ground-to-cutter interface, which enables the vehicle to cut a constant depth trench on side slopes. The vehicle also has a patented tilting function allowing it to trench around a radius, and to avoid undercutting the outside trench wall.

IHC is looking to use the Hi-Traq chassis as a platform for peripheral tooling; it provides better manoeuvrability and a more stable operating platform, while the four track system allows operation in soft soils.

The independent steering system supports crab, skid and wagon steering. This, in turn, enables the small radius trenching required for trenching inter array cables as they leave a turbine.

Hi-Traq has the capacity to stay on station in the high currents and wave action found at offshore renewable locations and so reduces operational downtime associated with conventional equipment.

IHC MERWEDE

IHC Engineering Business Ltd

What the Judges said:

"A world first turnkey project that met all customer requirements in an extremely challenging environment."

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Appealing to the crowd

A crowd funded open source design for a 3D printable prosthetic hand could be the start of a global network of micro manufacturing sites

The last few years have seen many people and organisations worry about the future of the UK's engineering sector. A decline in the number of students enrolling on engineering courses has been interpreted as potentially bringing problems in the future. While the trend appears to have reversed recently, quality graduates are emerging from UK universities.

The Young Engineer of the Year Award was of great interest to the Judges. They were looking who has 'hit the ground running'; someone who has applied knowledge and innovation to projects, who is motivated and who is acting as an ambassador for their chosen profession.

Joel Gibbard's interest in robotics moved him to want portray the technology as something to 'revere, rather than fear'. In his final year project for his Honours Degree in Robotics at the University of Plymouth, he designed a low cost prosthetic hand, something which his professors said would not be achievable in two university semesters. But he proved them wrong, creating a fully functional

prototype that has already won three awards.

Joel, the man behind the Open Hand Project, is creating Dextrus; something intended to replicate much of the functionality of the human hand. With electric motors instead of muscles, steel cables instead of tendons and a rubber coating for skin, the hand integrates 3D printed plastic parts that work like bones.

But Dextrus is not being developed for Joel's gain; instead, he is creating Dextrus as an open source project; all the information needed to create one is posted on the Open Hand Project's website. Not only will this make the hand more widely available, it will also allow the design to be improved as users feed back their experiences.

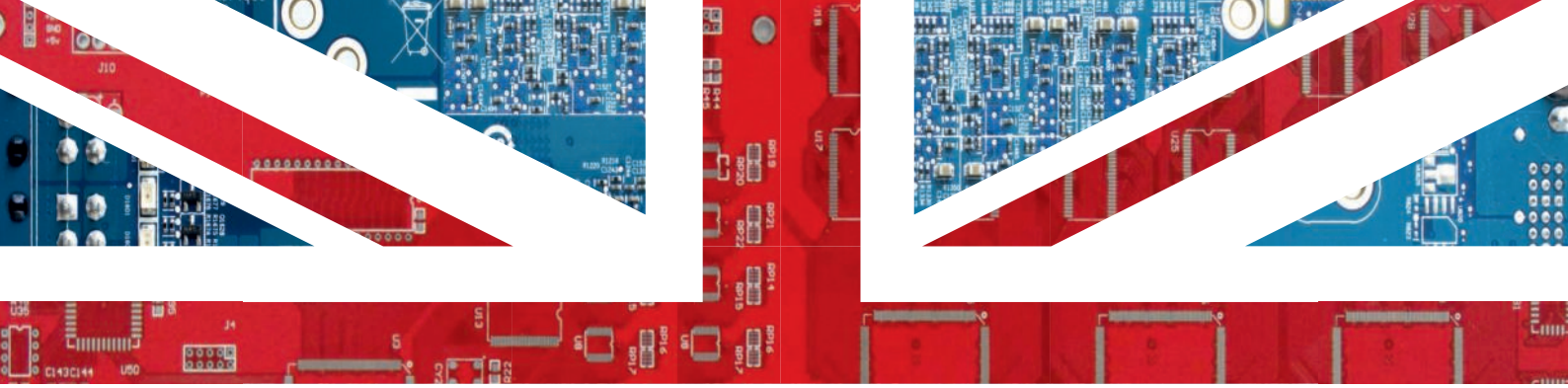
Still in his early 20s, Joel is passionate about the project. Supported by National Instruments, he has made a TED talk and has promoted Dextrus and the Open Hand Project through a range of publications. He thinks this highlights how an engineer with a good idea can singlehandedly make the world a better place.

In the future, he hopes to establish a network of micro manufacturing sites that can build and distribute prosthetics around the world, boosting local economies.

Congratulations to Matti Coleman, whose entry was Highly Commended by the Judges

What the Judges said:

"A highly motivated, dedicated young engineer with multidisciplinary skills and an impressive record of achievement already."



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Design Engineer of the Year

Animatronic achievements

Bringing innovation to bear whilst working to a tight budget

Any entry for a competition for a design engineer of the year which includes the phrase 'at the age of 14, Mike had already built his first jet engine and scorched the family lawn' is likely to have a favourable reception from a panel of engineers.

And so it was for Mike Franklin, a joint winner of this year's Design Engineer of the Year Award. But the ability to scorch a lawn is but one requirement. We were also looking for engineers who produced innovative designs within strict commercial limits and those who have also put something back into their profession.

Each project at Crawley Creatures requires a bespoke solution, allowing Mike to draw on his electromechanical, software and mechatronic knowledge.

He sees the objective clearly and excels in designing and manufacturing an end product that not only meets the client's needs, but also exceeds expectations in terms of cost, efficiency, durability and sustainability.

His expertise ranges from designing animatronic prehistoric creatures for the Natural History Museum to bespoke military test platforms.

Mike works on the whole project, rather than certain aspects. In this way, he can lead other team members more effectively. With an innovative approach to problem solving, he can evaluate and reevaluate throughout the design's life. As a fully qualified tool maker, Mike can also machine and assemble the components – he believes that being able to make components gives him a greater understanding of the whole manufacturing process and that a simple change to a component may greatly improve the ease of manufacture.

Mike is outward and enthusiastic in his approach to design engineering and keen to share his knowledge base internationally, nationally and on a local level.

Funded by the BBC and NESTA, Mike spent three months working with secondary school children to design and build robots. Along with Professor Noel Sharkey and three design engineers, Mike travelled to Beijing on behalf of the British Council, looking to promote British innovation and design by teaching people in China how to build low cost robots. On a local level, Mike has held various 'Show and Tell' talks with Scouts and Youth Groups in Northamptonshire about robotics and design engineering.

Whilst designing is his work, it is also his hobby. In 2005, he claimed the World Record for the fastest walking robot with Scuttle, an eight legged device.

What the Judges said:

"Achieving deep innovation using creativity, originality and ingenuity – all while working with limited resources and to extremely tight deadlines."

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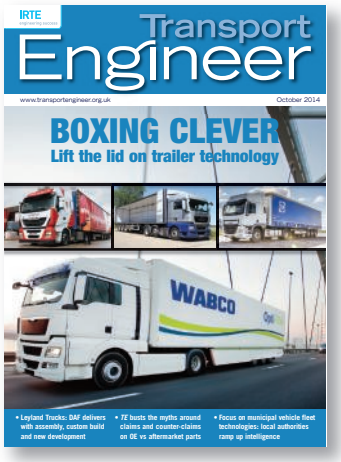

Passionate about engineering

Core to the company's success

Team leader takes ARM into a new area of technology

On its own, a processor core may not seem that important. However, when the applications for that core are considered, its role comes into sharp focus.

ARM is renowned for its origins in a converted chicken shed in Cambridge. From that humble start, it has grown to be one of the most important developers of intellectual property. And amongst the IP on its portfolio are the big.LITTLE configuration and the ARM Cortex-A53, the company's first 64bit processor. The development of both products was led by Peter Greenhalgh, a 13 year company veteran.

ARM has built its reputation on developing processors for use in mobile phones. As these phones get more complex, designers are under growing pressure to reduce power consumption so that users get the battery life they expect. ARM's big.LITTLE approach enables SoCs for mobile products to meet both needs. In fact, the latest big.LITTLE software and platforms can save 75% of CPU energy in low to moderate demand applications, whilst increasing performance by 40% for more demanding workloads. In developing big.LITTLE, Peter led a team of 50 engineers over three years.

Meanwhile, the Cortex-A53 processor has been designed to be a power efficient device, capable of supporting 32bit and 64bit code. Not only is it suited for use in smartphones, it is also being considered by a number of developers for use in data centres. Here, because the device offers greater performance for lower power consumption, it may well make a significant to the overall efficiency of the data centre.

The big.LITTLE and the Cortex-A53 projects were led by Peter from the initial design stage to verification and implementation. Both are said to have made a significant contribution to ARM's leadership in low power product designs.

Peter acts as a mentor to several junior engineering leads in ARM, helping to develop their skill sets and to ensure the next generation of ARM engineers is equipped to deliver the technology expected by customers. Alongside mentoring, Peter runs training courses to promote best practice engineering approaches and the lessons learned by ARM. He is also an active voice in the wider ARM ecosystem and industry.

What the Judges said:

"A leading creative force behind one of the world's – let alone the UK's – great design engineering success stories."

Andrew Burrows, chairman
Winner of the 2009 BEEAs Grand Prix, Andrew set up i20 Water in 2005 in order to develop technology that would reduce leakage and burst frequency on water distribution networks.
Previously, he was a pilot in the RAF and was appointed technical director for Seldén, the world's largest manufacturer of yacht masts. He has also led multidisciplinary design teams in the aerospace and marine industries.

Ashley Evans
Ashley Evans, director of electronics with techUK, started his career at British Aerospace, then worked in a number of sectors. Most recently chief executive of the Electronics Technology Network, Ashley was previously chief executive of Electronics Scotland and inaugural chair of the UK Electronics Alliance.

Phil Mayo
Phil founded Premier EDA Solutions and is a visiting industrial fellow at the University of Hertfordshire and a member of the University's Industrial Advisory Group and Industrial Certification Committee.
Committed to the success of the UK electronics industry, Phil believes engineering skills should be high on the list of national priorities.

Philippa Oldham
A chartered mechanical engineer, 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.
In May 2011, Philippa moved to her current role as head of transport and manufacturing with the IMechE.

Dr Andy Sellars
Dr Andy Sellars completed an industrially funded PhD at Strathclyde University, then joined Rolls-Royce Industrial Power Group. Following a brief period at Strathclyde University, he joined Spirent Communications, where he developed electronic instruments, and Electron Tubes. More recently, he has worked as an independent consultant and as lead technologist for high value manufacturing with innovateUK.

Justin Cunningham
Justin has a first class honours degree in Aerospace Engineering and spent 15 months following graduation with Astrium Space, working on future concepts of spacecraft. Since then, he has been worked as a technical journalist and is currently editor of *Engineering Materials* and deputy editor of *Eureka*.

Paul Fanning
Paul Fanning has been a trade and technical journalist for more than 15 years. Having started his career with Machinery & Production Engineering, he has gone on to edit a number of industrial titles and took over as editor of Eureka in January 2010.

Sebastien Cuvellier-Mousellien
Design Engineer of the Year and the overall Grand Prix prize winner at the 2013 BEEAs, Sebastien worked at Team Consulting as a senior engineering consultant for five years, during which time he established an international reputation for designing robust and capable medical devices.
He is now an independent consultant developing medical smartphone and tablet applications.

Graham Pitcher
An engineer by training, Graham has covered developments in the electronics industry for more than 30 years. He also has expertise in computer aided design, industrial automation and computing technologies. For the past 20 years, he has been involved with the development of *New Electronics* and has edited the magazine for more than 15 years. He is also group editor of Findlay Media's Engineering Design Division.

Eric Wilkinson
Chief operating officer for 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

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