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In this issue: Sensors, Test & Measurement • Rapid Prototyping • Pneumatics • Bearings & Linear Systems



Flights of imagination

The engineering innovations making solar-powered aircraft a reality

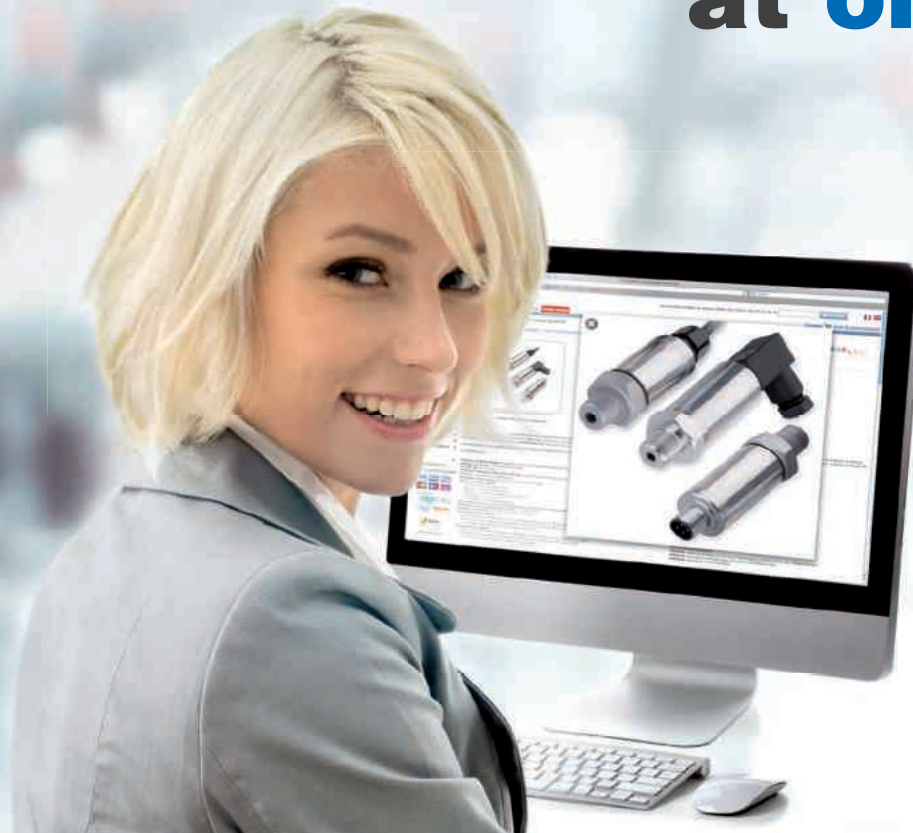
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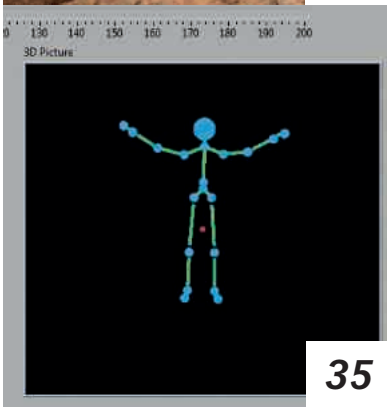
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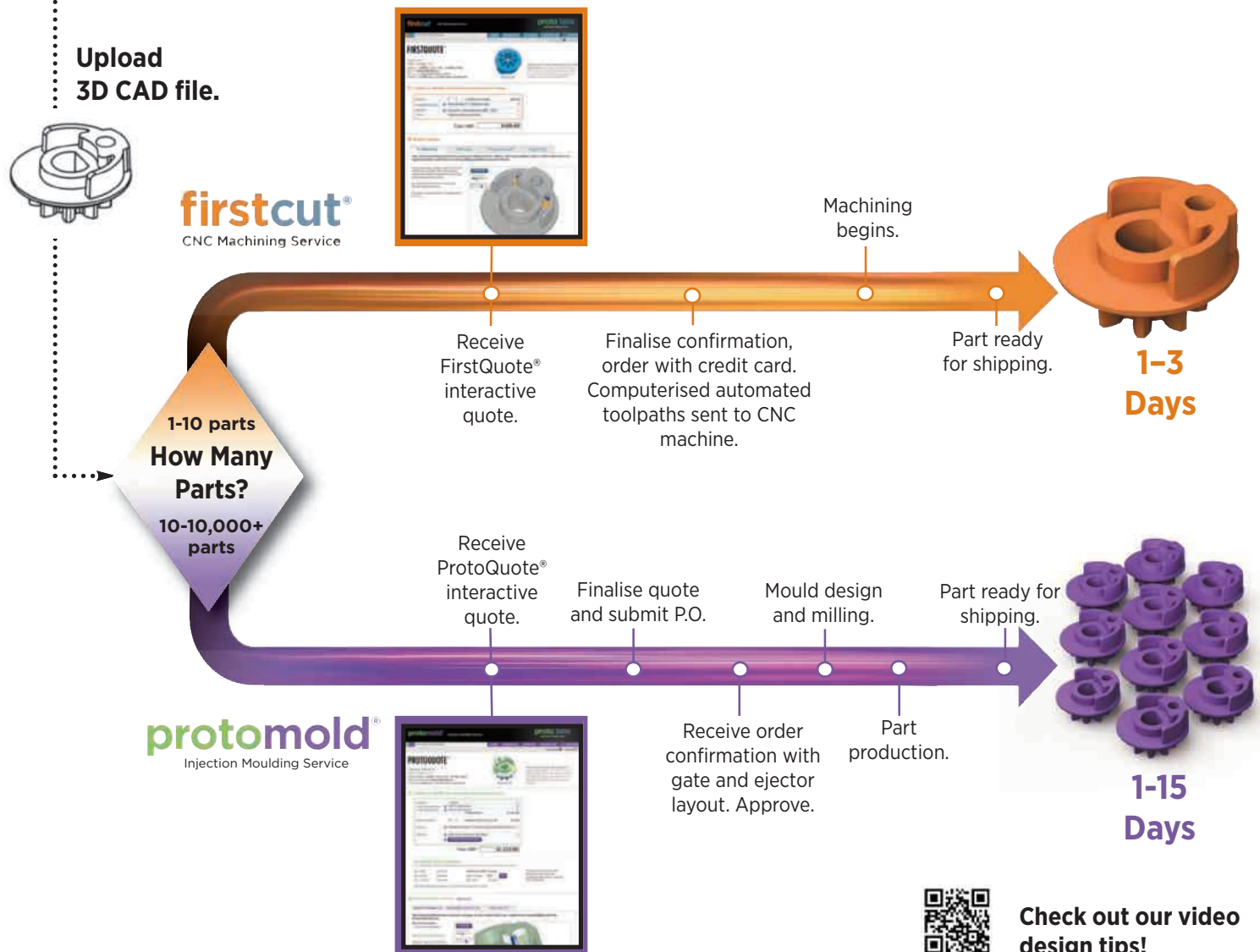


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Keeping sight of the challenge



Paul Fanning, Editor (pfanning@findlay.co.uk)

It is always a nice feeling for the New Year to be heralded by a positive set of figures for manufacturing and 2013 is beginning as we must hope it will continue.

This year's festivities were boosted by a growth in both manufacturing output and new orders, which helped to push the influential Markit/CIPS Purchasing Managers' Index (PMI) up to 51.4 last month from 49.2 in November, where anything above 50 signals expansion.

While these figures may not be stellar, they do represent a significant return to growth for the sector and are in marked contrast to those coming from some competitor countries.

Welcome though figures such as these are, however, it is important for everyone to bear in mind that manufacturing relies on engineering. The fact is that the manufacturing sector can only be successful if the engineering sector is healthy. After all, engineering fundamentally underpins manufacturing and, without significant and sustained investment in those underpinnings, the edifice as a whole will inevitably crumble.

And, as 2013 begins, it is crucial to acknowledge that, however positive manufacturing figures may be, engineering still faces some fundamental challenges and requires significant investment from Government, industry and society as a whole.

Of all the issues facing the sector, by far the most pressing is the ongoing skills shortage, which threatens to drain the UK's manufacturing base of its lifeblood – skilled workers. With every year that passes, this matter becomes more urgent. Let us hope that 2013 will see some real progress on this.

Now that really would make for a Happy New Year.

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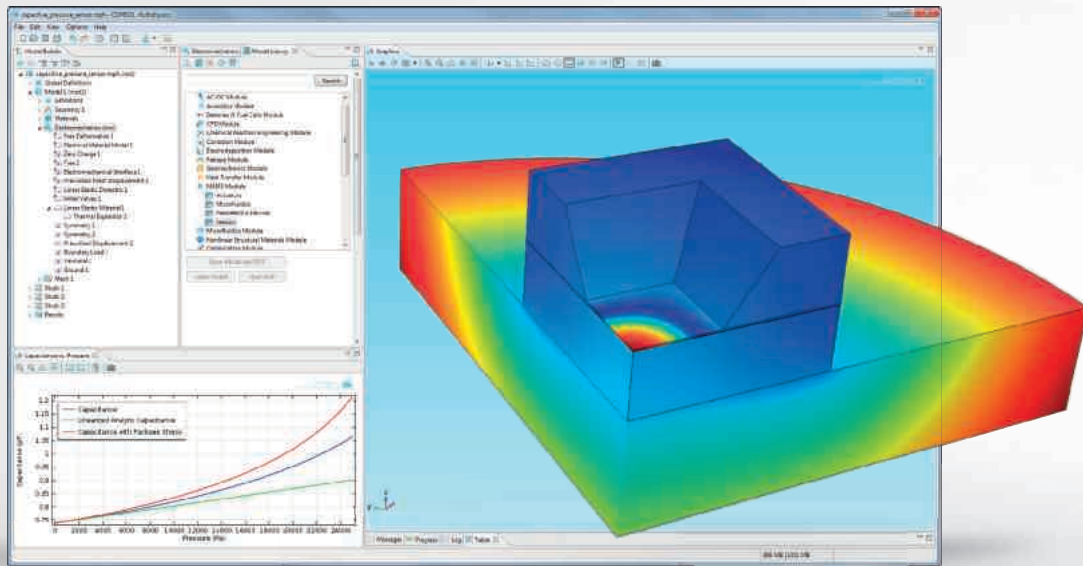
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UK manufacturing sector shows welcome growth

December saw British manufacturing grow at the fastest pace in 15 months, the latest figures reveal.

Growth in both output and new orders helped to push the influential Markit/CIPS Purchasing Managers' Index (PMI) up to 51.4 last month from 49.2 in November, where anything above 50 signals expansion.

According to Rob Dobson, senior economist at survey compiler Markit, the improved output came mainly in response to domestic demand, with the level of new export orders continuing to contract in line with low demand from the eurozone.

Dobson said the data signalled, "a reassuringly solid return to growth for the sector," although manufacturers remained, "on a cost-cautious footing."

Lee Hopley, chief economist at the EEF, also remained positive about the figures, but warned that the strength of the recovery would depend on what happens in other parts of the world. She commented: "2013 is likely to remain challenging and exporters, in particular, will be hoping to see stability in the eurozone and signs that demand will continue to hold up in the US and emerging economies in the coming months."

£28m boost for National Composites Centre

Chancellor George Osborne has announced an investment of £28million to enhance the capabilities and capacity of the National Composites Centre (NCC).

Located near Bristol, the NCC opened in November 2011 to meet the needs of industry, which is increasingly making use of composite materials which are light, strong and corrosion resistant.

The centre, part of the High Value Manufacturing Catapult program, will invest the money to construct additional facilities adjacent to the existing building.

As well as providing increased capacity and a dedicated high-speed composite manufacturing technology facility, part of the new building will be utilised to ensure a sustainable future for composites manufacturing skills in the UK workforce by bringing together leading businesses, colleges and universities.

NCC chief executive Peter Chivers (pictured) said: "I am thrilled by the announcement today, which reflects government's ongoing commitment to high value manufacturing and its growth in the UK. Composites are key to the future of many UK sectors and their endeavours to reduce CO2 emissions.

"The extended NCC will provide for further innovation in multi-sectoral manufacturing and technology development, skills and education, and offering greater support for SMEs and the supply chain. It will be fundamental in allowing the UK to remain competitive in this rapidly growing global market."



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£81m engineering facility to open at University of Sheffield



A new state-of-the-art engineering facility is to be built at the University of Sheffield. The £81million centre, which has just been approved by the City Council's planning officers, is expected to create up to 500 new jobs and provide a big boost to the local economy.

Pro-vice chancellor Professor Mike Hounslow, head of the university's Faculty of Engineering, said: "The decision to approve the university's planning application is excellent news.

"The research we carry out in the faculty is translated into practical applications at our Advanced Manufacturing Research Centre, attracting world-class companies such as Boeing, Rolls Royce and Siemens to carry out their business here.

"We now await final sign off from the Secretary of State to approve the demolition of the Edwardian extension to the Jessop Hospital but, with the Council's support, we are confident that the case for approval has been made."

Construction on the new development is expected to begin in 2013, and the building should be fully operational by 2016.

1600 additional engineering students are expected by 2020, with around 400 additional staff recruited as a consequence of that growth.

IET names UK's top female engineers

The Institution of Engineering and Technology (IET) has announced the winners of the 2012 Young Woman Engineer of the Year Awards, with engineering design graduate Yewande Akinola named as winner.

Made up of three coveted prizes, the awards seek to recognise the very best female engineers under the age of 30 working in the UK today, and inspire others to enter the profession.

Akinola, an environmental services engineer with ARUP, was recognised for her commitment to sustainability and innovation regarding water supply technology, including water sanitation methods for developing and underdeveloped countries.

A graduate from the University of Warwick, she holds a Bachelor's degree in Engineering Design and Appropriate Technology, and a Masters in Innovation and Design from Cranfield University.

Akinola walked away with the top prize of £2,500 and will now act as the new IET young woman engineer ambassador for 2013.

Upon receiving her award, she commented: "Winning this has encouraged me to work even harder to put all the effort I can into spreading the message about how successful women in engineering are and can be."

Zettlex and Astrium develop sensors for space



Cambridge-based sensor specialist Zettlex is collaborating with space technology company Astrium to develop high-resolution, non-contact position sensors for a range of space applications, including in-orbit systems and complex planetary robotics.

The LIMPET (Lightweight Miniature Precision Position Encoding Technology) project is a 12-month, industry led, applied research project. It is supported by the Technology Strategy Board within the National Space Technology Programme. It is aimed at developing high value products and services whose commercial exploitation will come from UK high tech manufacturing companies.

Astrium is involved in the design and manufacture of a variety of mechanisms that require accurate position sensing in harsh environments.

This activity focuses on two critical applications: devices

used for the deployment of and pointing of antenna and solar arrays.

Mark Howard, general manager of Zettlex commented: "The LIMPET project is a very important one for both parties. Position and speed encoders are common elements in space equipment but the requirements for high reliability in harsh environments are extremely challenging for traditional technologies such as potentiometers, resolvers and linear transformers, which are either insufficiently reliable or too heavy for space.

"The LIMPET concept offers a high precision, lightweight, miniaturised solution with the potential for ultra reliable operation, even in space's extreme environments. LIMPET uses a novel, no-contact, resonant, radio frequency sensing technique whose main components are arrays of printed conductors on thin, flexible, laminar substrates."



INNOVATE AND TECHWORLD JOIN FORCES

The Technology Strategy Board and UK Trade & Investment have announced a joint venture which sees the two organisations unite the highly successful Innovate and TechWorld events. The new, multi-sector, networking event 'Innovate UK' will provide opportunities for technology companies looking to accelerate their growth through innovation, international trade and investment.

Innovate UK takes place on 11-13 March 2013 at the Business Design Centre, London. It will bring together 4,000 people from UK and international business, Government and academia, with the aim of accelerating UK economic growth by stimulating business-led innovation and opening up international trade opportunities.

Tickets are now on sale, with early bird tickets priced at £99 including VAT available until midnight on Friday 18 January. Full price tickets are £125 including VAT. To get tickets, visit www.innovateuk2013.co.uk and click on 'register'.

Iain Gray, Chief Executive of the Technology Strategy Board said: "Both Innovate and TechWorld have long established track records of individual success, so we're really pleased to be uniting them under the single brand, Innovate UK. By inviting businesses across the UK to showcase their innovations and mix with experts in prolific technology innovation areas we hope Innovate UK will become an even greater show of the UK's entrepreneurial might, on the global stage."

Innovate UK will include seminars, workshops, an exhibition and keynote sessions featuring leading business and ministerial representatives. During the three days, businesses can share knowledge, access expert advice, showcase innovation and find collaborative partners.

Graphene sheets yield cheap, flexible solar cells

Researchers at MIT have developed a new kind of photovoltaic cell based on sheets of flexible graphene coated with a layer of nanowires.

The advance, they believe, could lead to low-cost, transparent and flexible solar cells that can be deployed on windows, roofs or other surfaces.

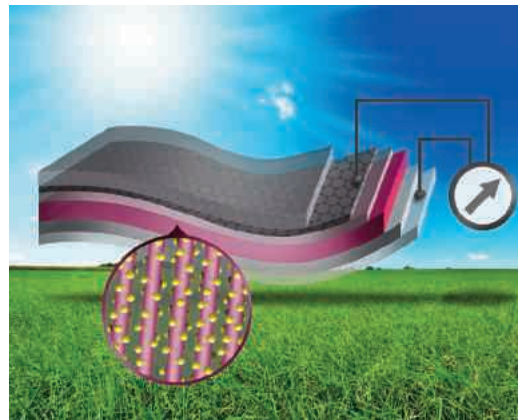
While most of today's solar cells are made of silicon, they remain expensive because the silicon is highly purified and then made into thinly-sliced crystals. Many researchers are exploring alternatives, such as nanostructured or hybrid solar cells, which rely on a material called indium tin oxide (ITO).

Now, the team from MIT has developed a material which they claim may be a cheaper alternative to ITO, and could provide other advantages such as flexibility, low weight, mechanical strength and chemical robustness.

In the past, graphene's stable and inert structure has meant that building semiconducting nanostructures directly on it without impairing its electrical and structural properties has been challenging.

To overcome this, lead researcher Silvija Gradecak and her team used a series of polymer coatings to modify its properties, allowing them to bond a layer of zinc oxide nanowires to it, and then an overlay of a material that responds to light waves — either lead-sulphide quantum dots or a polymer called P3HT.

Despite these modifications, Gradecak says the



innate properties of graphene remained intact, providing significant advantages in the resulting hybrid material.

"We've demonstrated that devices based on graphene have a comparable efficiency to ITO," she noted — in the case of the quantum-dot overlay, an overall power conversion efficiency of 4.2% — less than the efficiency of general purpose silicon cells, but competitive for specialised applications. We're the first to demonstrate graphene-nanowire solar cells without sacrificing device performance."

In addition, Gradecak says the manufacturing process can be carried out at temperatures below 175°C, and is easily scalable.

Composites sector gears up for JEC

The JEC Europe – Composites Show & Conferences – the composites industry's largest international technological showcase, will take place from March 12-14, 2013 at the Paris Porte de Versailles.

Including conferences and a trade show of an unprecedented scale, 12 key themes will be highlighted during the event: Design, Non-Destructive Testing, Robotics, Aeronautics, Automotive, E-car, Wind Power,

Carbon, Biocomposites, Thermoplastics, Multifunctional Materials and Environment.

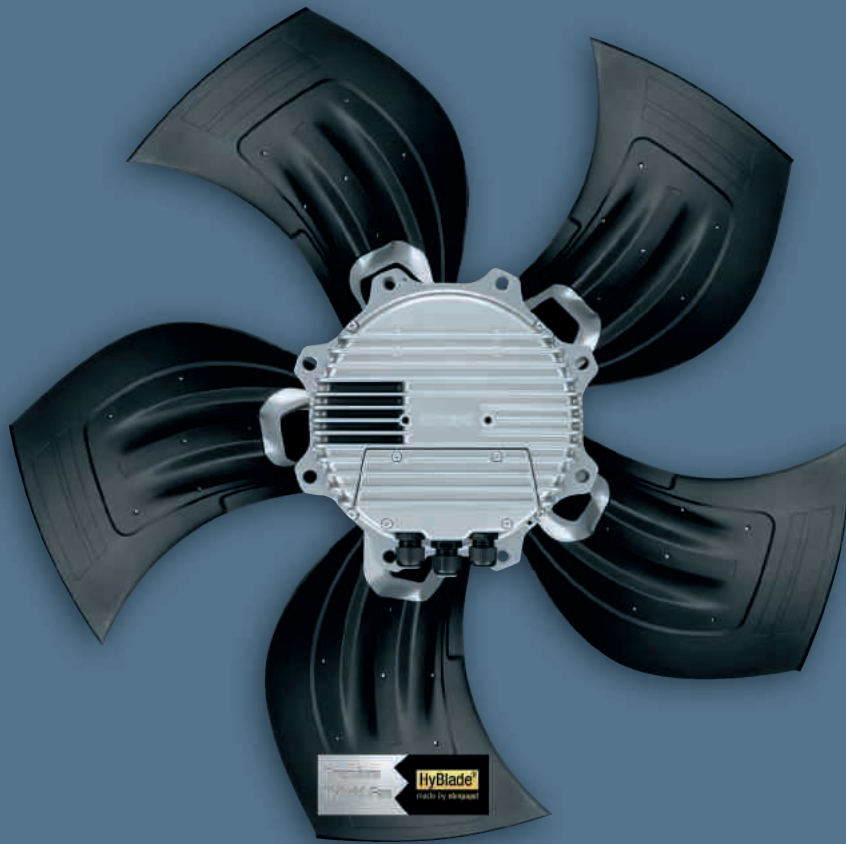
With 50,000m² of floor space, the equivalent of eight soccer fields, the JEC Show will represent the global composites industry and its most recent advances in heavily composite-consuming sectors such as aerospace, aeronautics, shipbuilding, railway, automotive, mass transportation, construction, equipment and sports and leisure.

The global composites market represents €81.6 billion in value and 9.2 million metric tons in volume for 2012. This market is growing an average of 6% per year. Composites are used more and more often to lighten structures, aircraft, and vehicles in general.

Frédérique Mutel, JEC Group President and CEO, highlights the innovative nature of the industry, saying: "Innovation is present in each of the steps of the value chain."



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ABB launches high-power pump motor

ABB has introduced a new two-pole motor to complete its high voltage modular induction range. With the new motor, the range extends from IEC frame size 400 to 800, therefore covering all general high voltage needs in today's markets.

There are tough challenges to overcome when designing high-voltage, high-power motors, particularly with regard to cooling and stresses. ABB's engineering team used FEM (finite element method) analysis to optimise air flows, and improved the ventilation for effective cooling. A new rotor bar construction was designed to ensure that the rotor will withstand all the stresses arising during start-up and running. The shaft is solid to provide the necessary rigidity.

The new motor can be operated with supplies from 6 to 13.8 kV. It is initially targeted at fixed speed applications up to 3,000 rpm with direct-



on-line connection. Variable-speed drive operation is possible, but the speed range is fixed on a case-by-case basis for each application. The motor is

designed for horizontal mounting and is equipped with sleeve bearings. For use in explosive atmospheres, the available protection types are non-sparking (Ex n) and pressurised (Ex p).

With its low vibration levels, robust construction, low maintenance requirements and excellent reliability, the new motor provides a very low overall cost of ownership. ABB high-voltage induction motors are perfectly engineered according to individual customer requirements.

www.abb.com

HMIs provide transparent link



Complex production lines and installations can often see key components located at different ends of a machine, in different rooms, or even on different floors. However, in such a decentralised system, it is very difficult to debug a PLC program during commissioning or after an upgrade or modification without being able to watch the machinery in operation. The result is

extended debugging time or the need for two or more personnel to coordinate their efforts. The GOT1000 series of HMIs from Mitsubishi Electric eliminates these problems through a special FA transparent function that enables a PC connected to the HMI to link directly through to other Mitsubishi Electric Automation Systems products.

Now, wherever these components are on the production line, engineers can form a direct link to them from a PC connected just to the HMI, enabling both the GOT1000 terminal and the PLC program to be debugged in a single, efficient operation. Because touch panel operation is enabled even when the PC is connected, engineers can see exactly how any modifications to the programs will impact on the machine operation.

This ability to perform debugging locally or over decentralised systems can dramatically shorten downtime, thus increasing machine availability.

<http://automationsolutions.mitsubishielectric.co.uk/>

Chain thrives under high wear

One of Europe's largest producers of asphalt for road construction had found that the roller chain it used to drive its conveyors tended to have exceptionally short service periods before replacement was required. Standard 16B chain was used to reduce purchasing costs, but the downtime and maintenance requirements meant that the Total Cost of Ownership (TCO) remained high.

Tsubaki was approached to provide a solution. It suggested that its latest BS/DIN European premium chain GT4 Winner would last significantly longer than other premium chains on the market. BS chain GT4 Winner is one of the most advanced chains that Tsubaki produces, it boasts four key features which are designed to reduce wear and chain elongation.

Lube-grooved (LG) bushes hold oil at the point of contact which provides an internal reservoir for lubricant where the chain needs it most, while seamless and perfectly cylindrical bushes result in both better contact between the pin and bush and improved lubricant retention.

In addition, the chain includes centre sink rivets for easy disassembly, which are designed with markings to identify pin rotations caused by chain overloading. Ring Coined connection links allow the chain to be specified up to its full kW rating; unlike the typical standard slip-fit connecting links used by competitors which are usually much weaker than the base chain.

<http://tsubaki.eu>



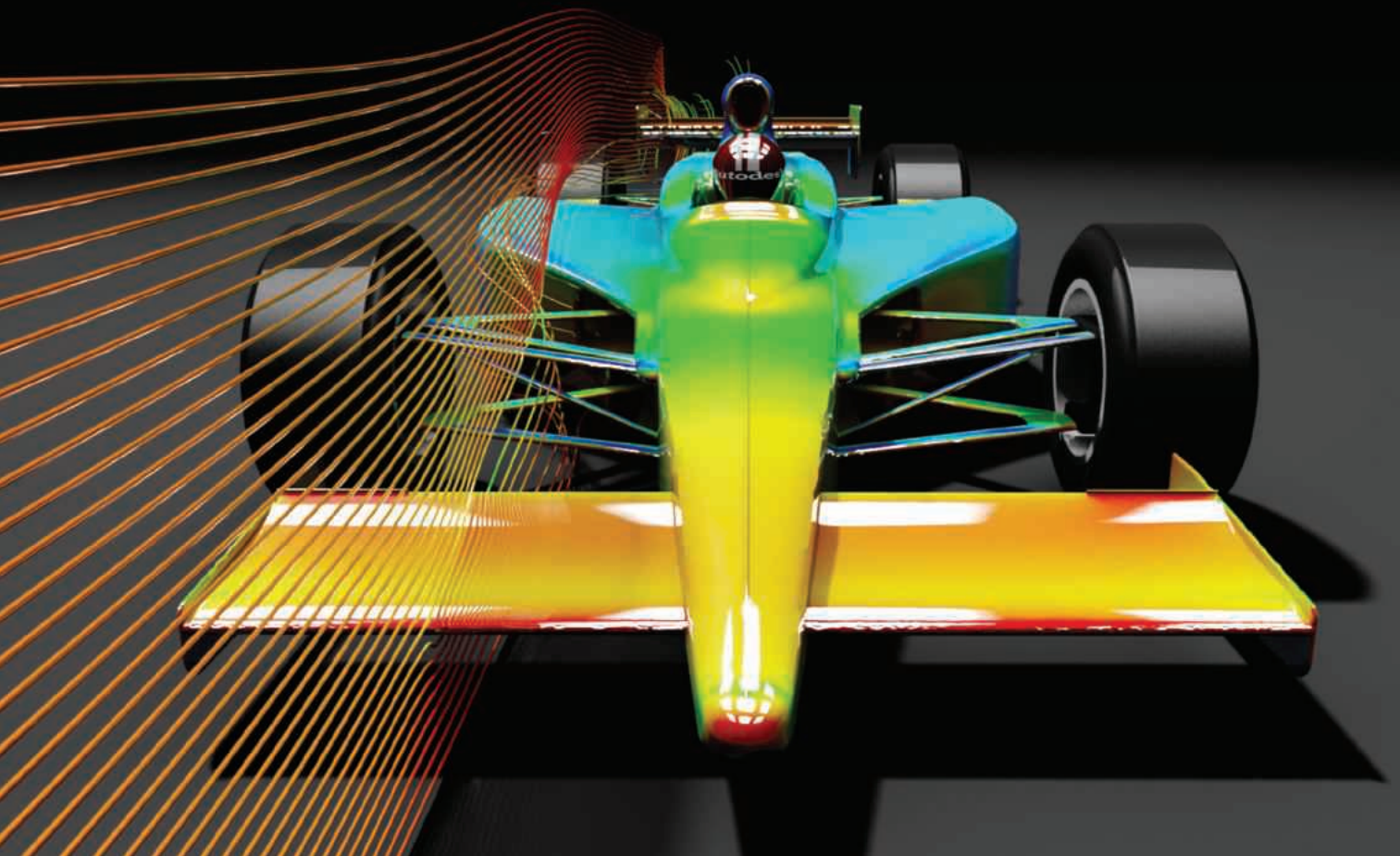
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Lightweight material to improve protection

Lockheed Martin has teamed up with University of Surrey researchers to develop a new lightweight material that could improve the protection and survivability of armoured vehicles, including those used by the British Army and Special Forces.

Ceramic materials are extremely resistant to penetration by hostile weaponry while being less heavy than traditional armour plating, but a weakness in the adhesive bonding connecting ceramic plates to their backing has made them less robust than traditional metallic armour.

Now, scientists at the University of Surrey have developed a method for treating the ceramic materials to improve the bond strength of both alumina and silicon carbide ceramics to the composite backing. This, they claim, greatly enhances the robustness



of the protective armour to better meet operational needs in hostile environments.

Results have shown that using the technique on alumina and silicon carbide surfaces leads to increased bond strength. The tests revealed that when a 14.5mm armour piercing incendiary was fired at the panel it remained intact under a multi-hit environment.

www.surrey.ac.uk

Solution to last month's Coffee Time Challenge

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The Solution to last month's Coffee Time Challenge of how to come up with a solution to help people with disabilities eat or drink more easily comes from British inventor Chris Peacock.

Peacock, who has a Masters in Design Engineering from the Royal College of Art, developed the handSteady mug after a close family member was diagnosed with Parkinson's. He could see how this would one day make drinking with a cup difficult and unsafe and came up with a solution.

handSteady is the world's first cup to incorporate Rotatable Handle technology. It operates in a similar way to a steady camera that film producers use to get a steady shot. The Double Arc handle design ensures a comfortable and secure hold for up to four fingers – which is great for people with a limited grip.

State of the art materials have been deployed with self-lubricating bearings to ensure the mug can be dishwasher, colour matched to bone-china and not break if dropped. The design incorporates Curved Rim technology to ensure the rim of the cup is comfortable for the lips, avoid drip stains forming on the outside of the cup and guides liquid to the centre of the mouth.

The product comes with an anti-slip base which grips cups to tables and removes the need for coasters and absorbs the sound of cups when placed on a surface. The Hidden Lid resides below the rim of the cup, has a drink hole, reduces spillages and is discreet enough to ensure people's dignity is maintained.

<http://www.handsteady.com/>



New Read/Writer avoids distortion

The new RFU630 UHF RFID system from Sick is achieving high levels of performance in challenging factory environments and overcoming the problems of poor signals caused by proximity to heavy metal machinery and plant.

The RFU 630 read/writer avoids signal reflection and distortion in "high noise" conditions and is therefore ideal for factory, production or logistics environments. The RFU630 operates with high accuracy where barcode and other part marking is masked, covered by dirt and paint or not line-of-sight.

The RFU630 is a compact and rugged device with an integrated antenna and capacity for connection to three external antennae for transponder identification in complex goods flows. The multi-ident and anti-collision features ensure high accuracy and digital inputs, such as from a trigger photo electric sensor, can be accommodated.

www.sick.co.uk

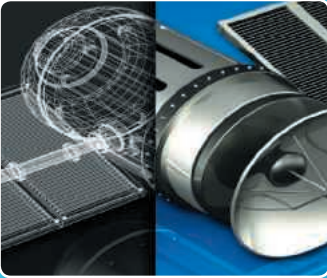


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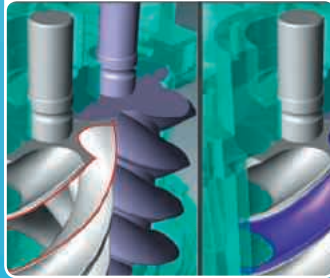
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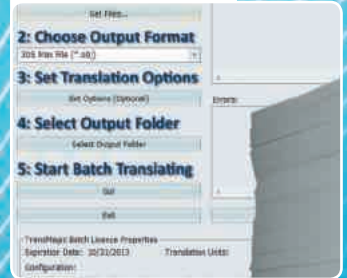
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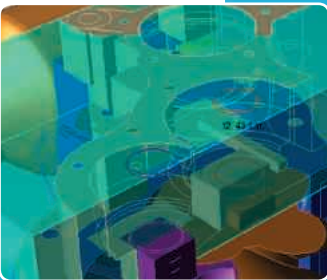
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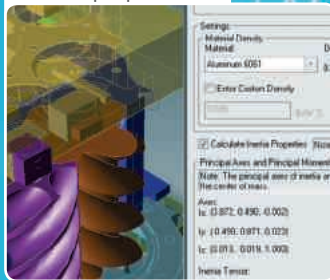
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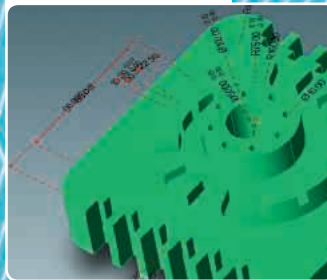
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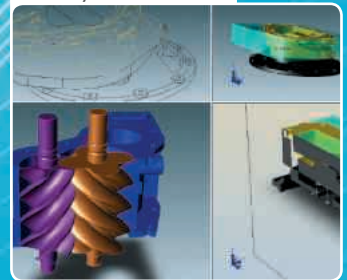
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Product Manufacturing
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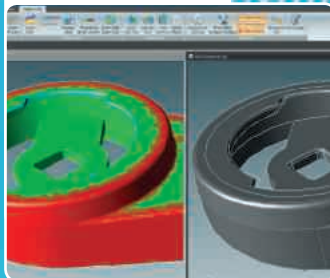
High Translation
Quality



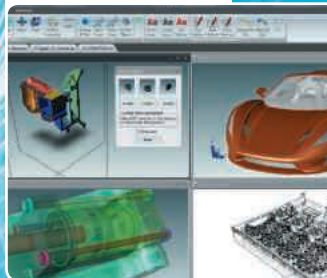
Close geometry into
solid models



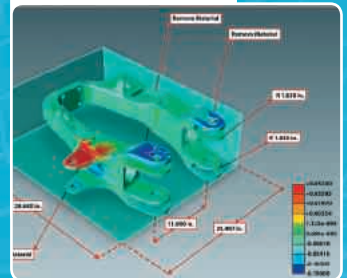
File comparison &
validation



Scalable product line



Report generation



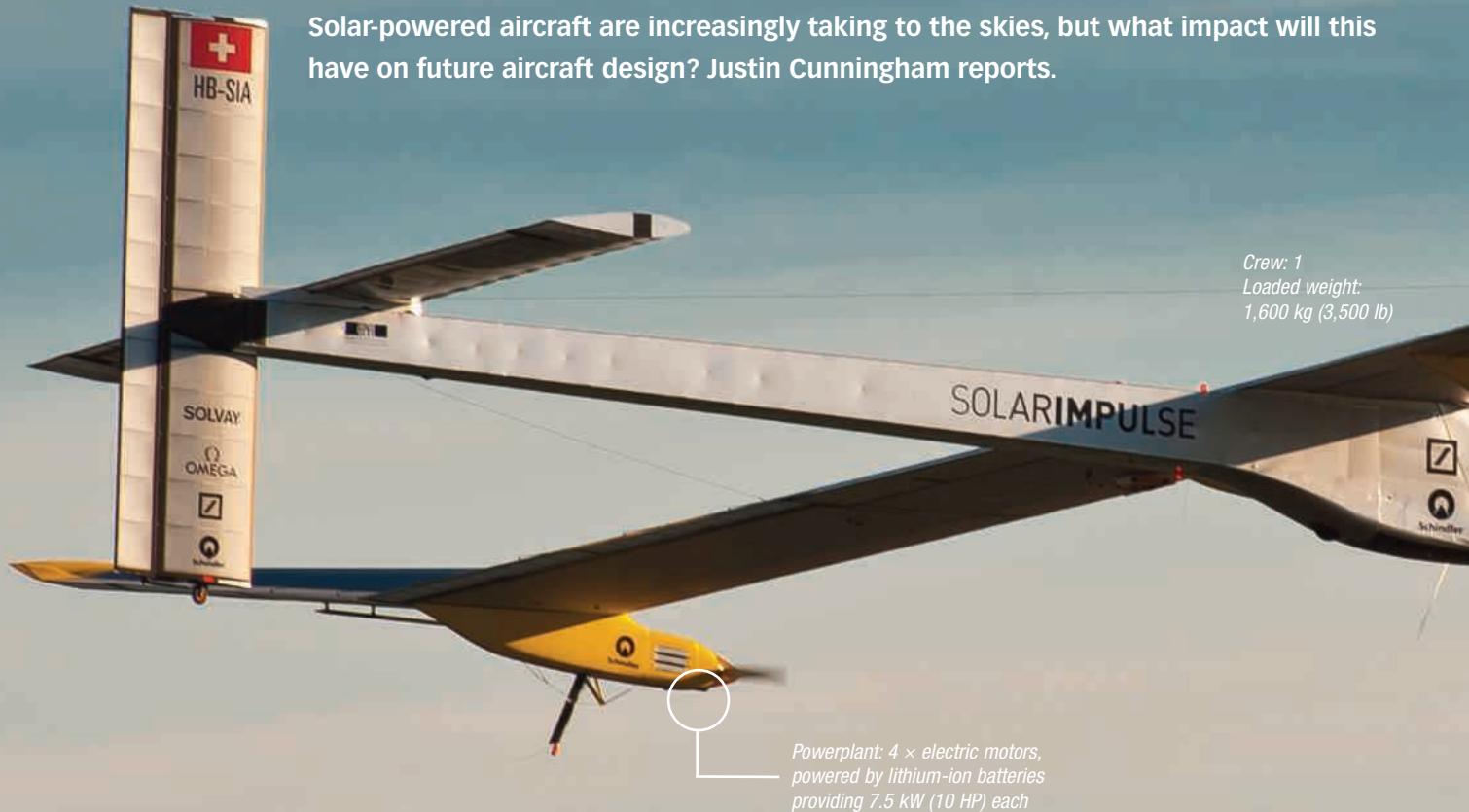
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Solar aircraft

Solar-powered aircraft are increasingly taking to the skies, but what impact will this have on future aircraft design? Justin Cunningham reports.



Crew: 1
Loaded weight:
1,600 kg (3,500 lb)

Powerplant: 4 × electric motors,
powered by lithium-ion batteries
providing 7.5 kW (10 HP) each

The drive for increasing efficiency is something that features regularly on the pages of Eureka. Getting the biggest bang for your buck, extending range and limiting emissions are all fairly mainstream targets for most major sectors. Driving these innovations are factors such as the cost of fuel and the need to reduce environmental impact. So it is interesting to follow the developments of aircraft that have zero fuel costs and that produce absolutely no emissions at all during flight.

There have been two main European solar powered aircraft in recent years that have attracted much media attention. The two have taken different approaches in that one is piloted, while the other is not. However, despite the other obvious difference of scale, both have shown impressive flight capabilities.

Solar Impulse is a Swiss solar-powered aircraft led by aeronaut Bertrand Piccard, who co-piloted the first balloon to circle the world non-stop, and Swiss businessman André Borschberg. Though neither expects solar aircraft to scale up to larger airliners, it is the principle of sustainable travel that they want to demonstrate.

Inherent to this principle is the desire to push back the frontiers of

knowledge in materials science, energy management and the man-machine interface that has inspired the aeroplane's creation. The ultimate goal is to continually fly around the world in 2015 in the Solar Impulse HB-SIB.

However, its current development aircraft – the Solar Impulse HB-SIA – has allowed concepts to be proven, lessons to be learned and systems to be trialled. The aircraft itself is actually more substantial than you may imagine. Its 63.4m wingspan is covered in 11,628 photovoltaic cells over an area of 200m². This produces enough electricity to power its four brushless electric motors, each with a set of polymer lithium batteries, and a management system controlling charge and temperature thresholds.

Each motor has a maximum power output of 10HP and a gearbox limits the rotation of each 3.5m diameter, twin-bladed propeller to 400rpm. Over a 24-hour period the average power used is 8hp, or 6kW, roughly the power used by the Wright brothers' pioneering Flyer in 1903.

Yet the structure itself is significantly heavier than the Flyer. With a loaded weight of 1600kg and maximum takeoff weight of 2000kg, many cynics said it would never get off the ground. Yet it's had numerous



take off

Wingspan: 63.4 m (208 ft)
Wing area: 200 m² (2,200 sq ft) covered
with 11,628 photovoltaic cells

Cruise speed: 70 kph (43 mph)
Endurance: 36 hours (projected)
Maximum altitude: 12,000m (39,000 ft)

successful flights, including a non-stop 19-hour trip from Spain to Morocco as well as numerous other day and night flights.

The opportunity to push technological boundaries was what inspired Bayer Material Science to join the project. "That is a major aspect of our involvement," says Martin Kreuter, project leader at Bayer Material Science for Solar Impulse. "Our business is very streamlined, there are many cost restrictions and other limitations. That's something that can be overcome in this project. It allows the people to think outside the box, to be creative and look for innovation without the pressure of daily business."

On the first aeroplane, the HB-SIA, Bayer was using off-the-shelf products. Polyurethane foam was used for the wing tips and in the motor gondolas. A polycarbonate film was also used in the cabin window

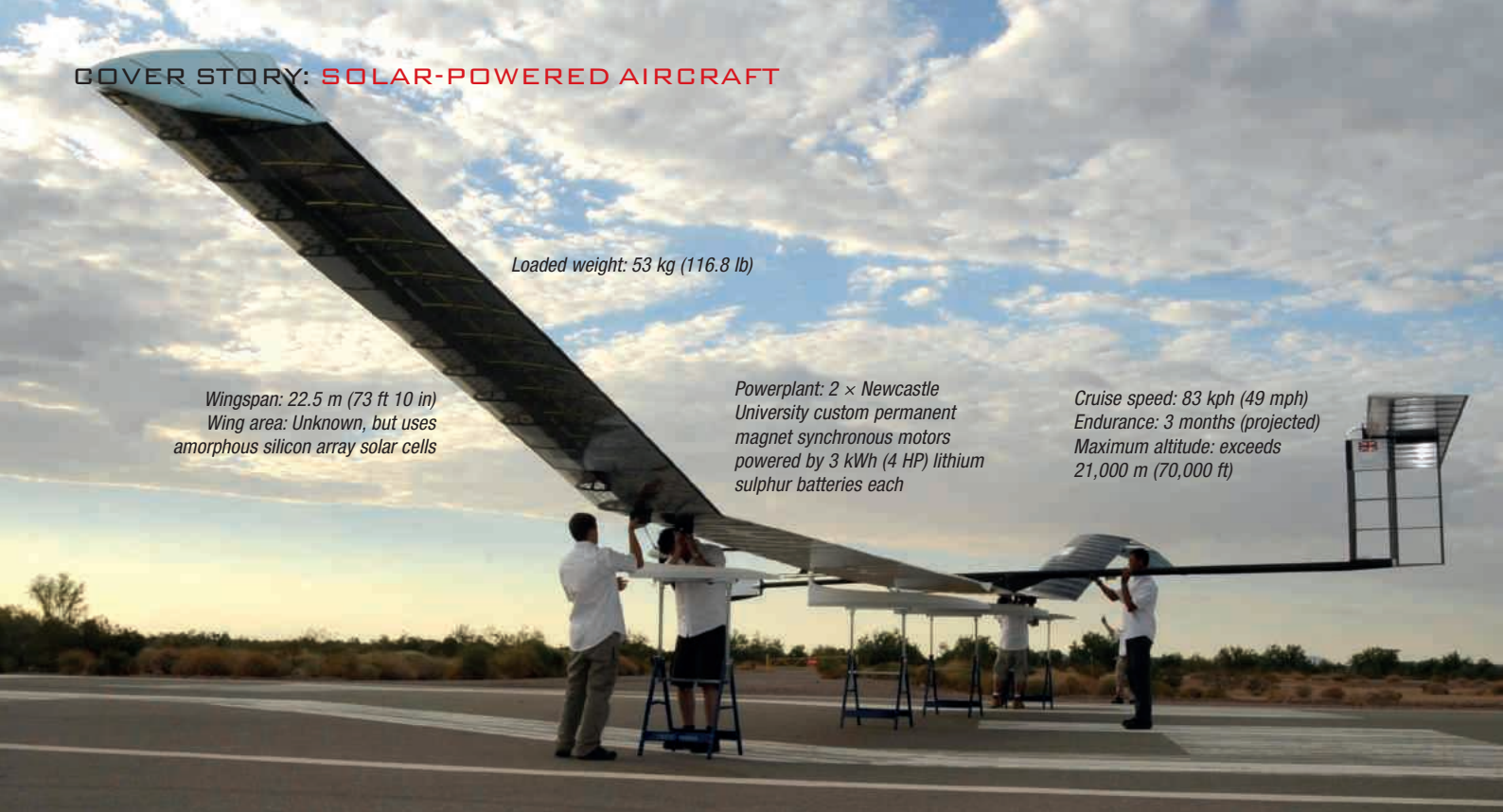
as well as various commercially available adhesives and coatings.

However, it is currently optimising materials for the second aircraft (HB-SIB), in which it has system responsibility for the cockpit module. The windows were previously made from a polycarbonate film, but will now use a thermally formed polycarbonate sheet to allow for a more aerodynamic design.

This ability to apply innovation in a fairly open environment not only acts as inspiration for the engineers, it also has potential technology transfer benefits. One example of this is the work done to optimise the density of polyurethane ridged foam, which provides better insulation properties. This can in turn reduce wall thickness.

"We can also see that foam being used in electric vehicles," says Kreuter. "Insulation of lightweight vehicles is a major issue. You can't use thick foams of the sort used in building insulation, and that is where these solutions could really have benefit. And if you look at carbon fibre reinforced plastics (CFRP), we tried polyurethane as a resin material. The main resin material in CFRP is normally epoxy which has a long curing time. This makes it unfeasible for mass production. But polyurethane could act as an alternative as it has a short cycle times and is capable of





Wingspan: 22.5 m (73 ft 10 in)
Wing area: Unknown, but uses
amorphous silicon array solar cells

Loaded weight: 53 kg (116.8 lb)

Powerplant: 2 × Newcastle
University custom permanent
magnet synchronous motors
powered by 3 kWh (4 HP) lithium
sulphur batteries each

Cruise speed: 83 kph (49 mph)
Endurance: 3 months (projected)
Maximum altitude: exceeds
21,000 m (70,000 ft)

high output. It is important to Bayer to have these innovation impulses. Not everything we investigate will make it to the aircraft as a solution. Many things will stay on a conceptual level and might well be used on other projects in the future."

While inspiration and a sense of adventure play a big part in the development of the Solar Impulse project, it was practical application that was a key driver for UK defence and aerospace company Qinetiq. The team were faced with finding a better way of operating military satellites to provide surveillance.

The result was Zephyr, an ultra-lightweight unmanned solar aircraft that can fly for months at a time and can carry a similar payload as a satellite in space. The advantage is that Zephyr is a fraction of the cost of space-bound satellites, can be quickly launched from anywhere and can land for routine maintenance at anytime. Qinetiq hope it will act as an alternative to surveillance, communication and remote sensing satellites in a variety of civil and military applications.

Chris Kelleher, the chief designer of high-altitude endurance unmanned aerial vehicles at Qinetiq, led the project team and began exploring whether aircraft could be left in the stratosphere permanently. The problem, however, was that the technology simply did not exist.

"We investigated all possible routes to create an aircraft that would fly permanently in the sky unmanned," says Kelleher. "We recognised the operational cost savings that this would create for defence teams that would use these aircraft for communication purposes."

The team began by evolving a bike-driven aeroplane originally designed in 1923. From this concept, the team was able to explore a series of developments and test flights that would evolve into Zephyr.

"We were building something very light and strong while at the same time exploring aerodynamics that no other aircraft had ever operated," says Kelleher. "The reason no one had done this before was because you needed a threshold performance level to fly continuously overnight as well as the ability to store energy and maintain altitude."

The team began developing various sections of the aircraft and an improved version was built and continuously flown for three and a half

days. The aircraft has gone through many developments and iterations with the current Zephyr 7 having a wingspan of 22m and weighing just 40kg. Its wings are designed to maximise the use of thermal air currents to reach high altitudes and to launch Zephyr a team runs gently into the wind until it lifts out of their hands.

The structure is made up almost entirely of carbon fibre. Again it is the 3kWh lithium sulphur batteries that take up most weight. During the day, Zephyr uses amorphous silicon array solar cells no thicker than a sheet of paper spread across its wings to feed electricity to recharge its batteries and power two brushless motors that drive the propellers. At night, the energy stored in the batteries is sufficient to keep Zephyr in the sky, although it is likely to lose about 20,000ft.

"Zephyr 7 truly tested the mechanics of its structure and its ability to store power," says Kelleher. "One of the biggest breakthroughs we had was getting extremely low drag through the aircraft along with a very light structural weight, while at the same time not being too fragile to handle. By using very high modular carbon fibres, we were able to take this to the extreme."

In 2010 the aircraft flew for a record time of 14 days and 22 minutes reaching altitudes in excess of 70,000ft. Aiming for a target of three months, Qinetiq's engineers will tailor Zephyr for operational roles such as fire detection, piracy or surveying large areas of land and ocean.

Solar Impulse and Zephyr are impressive examples of innovation. While it is unlikely that we will all one day board a solar-powered airliner, it is not so farfetched to think that solar energy may well be harnessed to supply some onboard power. It is also likely that space satellites could be replaced, at least on some scale, by unmanned aircraft cruising high in the stratosphere.

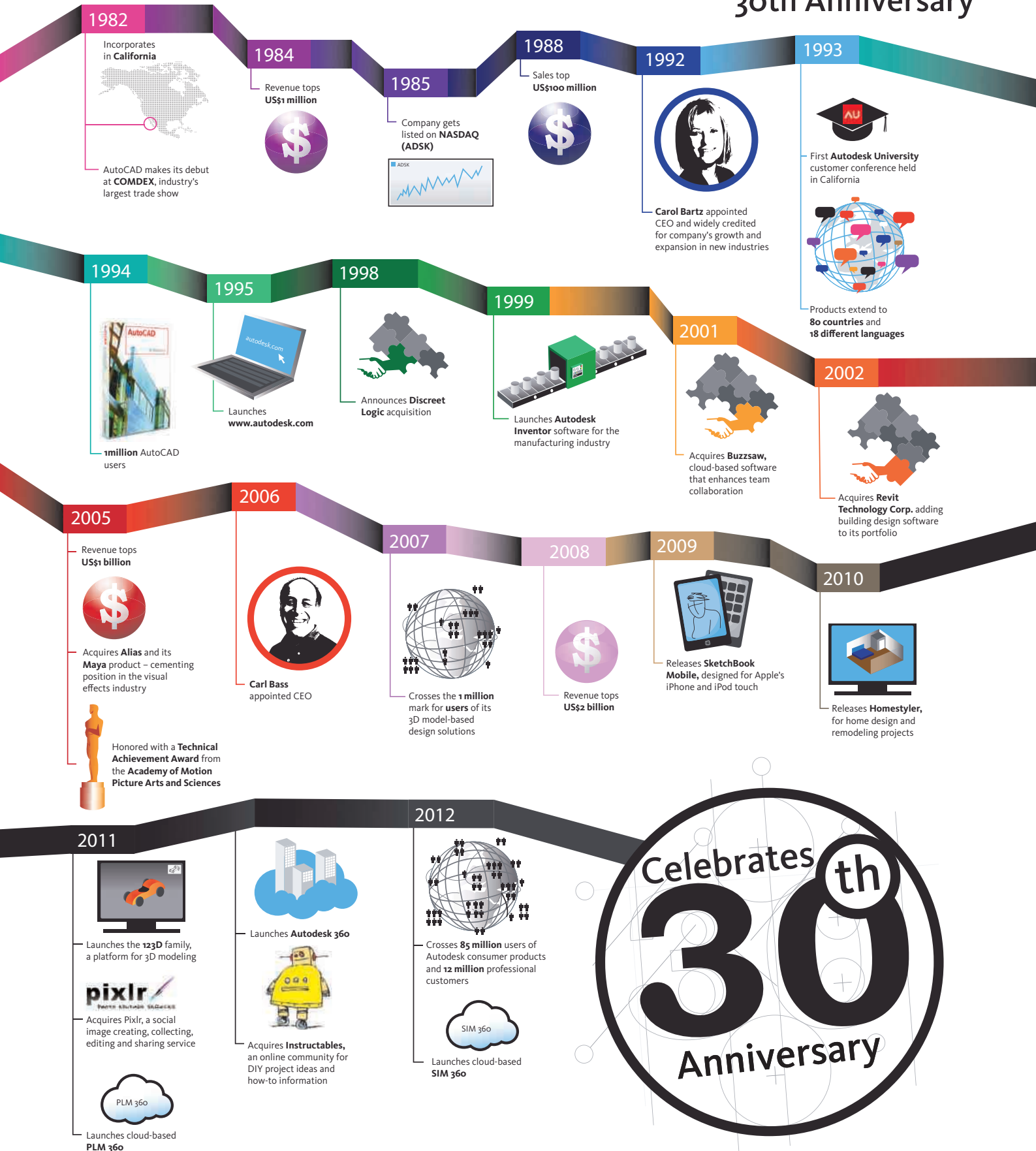
The true benefit of these projects, however, is the transferable developments in materials, sensors and solar technology it has driven, as well as the creativity and innovation it has inspired among the engineers that have worked on them.

www.solarimpulse.com
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James White (left) with Graham Maggs of Mouser Electronics, sponsor of the The Design Engineer of the Year award at the British Engineering Excellence Awards



Loads of potential

His work with Caterpillar was not the only thing that won James White the Design Engineer of the Year Award, as Paul Fanning discovers.

For James White, the path to the coveted position of the British Engineering Excellence Awards Design Engineer of the Year for 2012 began – as with so many engineers, with an innate desire to see how mechanisms worked. “From an early age I was into taking things apart and building things,” he says. “First of all Technical Lego, then Airfix kits and then flying model aeroplanes. It seemed like a natural progression.”

White received his award in recognition of his work with Caterpillar at Desford, Leicestershire. He has worked at this location ever since graduating from Loughborough University, first as a contractor and now as a senior design engineer with the company.

During his time with Caterpillar, White has gained a broad range of experience. This has included designing structures, hydraulics and systems for use on the company’s excavators, wheel loaders and backhoe loaders. This sort of diversity of experience, he believes, is something that is a major benefit of working for a large, multinational. “It feels like every project I’ve worked on has been totally different to previous ones, so you end up building up new levels of expertise in different areas. There are always new challenges. As you move into different teams and undertake different projects, your experiences inform everything else you do. So my experience in lines routing, for instance, will alter the way I approach other aspects of design to take that into account.”

A recent project saw White lead the development of three loader arm assemblies. The two-year project has for the first time given Caterpillar a family of loader arms with a common design for its backhoe loader products. The project also reduced the number of loader designs from five to three and increased manufacturability and assembly efficiency.

During this project, White directed analysis, performance, electrical and hydraulic development teams through Caterpillar’s design process and worked with suppliers to produce the optimum structural design, whilst ensuring this did not constrain cost-efficient, robust machine design. He also hit all long and short term goals over the two-year project. In addition, White is named as the designer of an innovative clamp protected by design rights and has a patent pending for an element of the next-generation loader arm design.

Impressive as his achievements with Caterpillar were, however, there was another element to White’s activities that drew particular

admiration from the BEEAs judges. He has been a mentor for an Engineering Education Scheme Project developing a tyre test rig. Over the six month project, he provided the team with guidance in planning, technical design, manufacture, report writing and presentation skills. He also supported the team during a three-day residential workshop. In addition, he has so far given five work experience students an insight into engineering and is in the process of creating three engineering experience design projects for future students.

This scheme is one that has particular resonance for White, as it was through an Engineering Education Scheme that he came to study engineering and pursue his subsequent career. He says: “It was ironic that I did an engineering education scheme project myself and then went on to mentor a team of students. I kind of came full circle, really.”

He believes that, having undertaken a similar scheme himself made a big difference to his approach to his role as mentor. “Students are generally told things rather than being asked to think about things or develop ideas, so I really wanted to get them to think outside the box,” he says. Other lessons White is keen to impart include attention to detail, but as important, he believes, is a willingness to work with others. “You have to be able to work as a team player,” he says. “You’re not just designing a product, you’re guiding it and managing it through a process to get it to where your initial idea reaches production. Along the way, you have to harness the skills of your colleagues in many other areas. You don’t have to be right all the time. Others have skills and knowledge you need to make use of.”

His most fundamental advice for success, however, is to keep designs as simple as possible. He says: “Simplicity will make your design more robust, lighter, lower cost, with fewer parts and easier to assemble. Generally, the best thing is to keep things simple, but it’s not as easy as it sounds. It’s much harder to design something simple than it is to design something complex.”

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Additive manufacturing hits the big time

EuroMold saw some major launches in the additive manufacturing field – including the biggest commercially-available 3D printer yet. Paul Fanning reports.

The biggest news (in every sense) to emerge from the recent EuroMold exhibition in Germany was the launch of Objet's latest and largest machine to date, the Objet1000. The name derives from the machine's wide-format build envelope of 1000 x 800 x 500 mm.

The Objet1000 is claimed to be ideal for automotive, defence and aerospace applications, industrial machinery, consumer goods and household appliance sectors as well as high-end service bureaus that need to create industrial size, 1:1 scale prototypes.

Designed for all-round fit, form and functional prototyping, the Objet1000 combines a large and easily accessible build platform with the advanced precision of inkjet 3D printing and Objet's renowned Connex multi-material



capability – all in a single machine.

According to Objet CEO David Reis: "As our largest ever 3D printing system, the Objet1000 takes advanced inkjet 3D printing technology to the next scale. The system enables our customers in a range of industries to now quickly and effectively prototype anything at full-size, 1:1 scale, from whole aeroplane and automobile assemblies to complete household appliances. The Objet1000 is the next step in the 3D printing revolution."

The Objet1000 saves manufacturers and designers from having to assemble prototypes from smaller-sized jigsaw pieces or from having to use various, less effective, or efficient solutions.

Igal Zeitun, VP for product marketing and consumables at Objet adds: "Unlike comparable 3D printing systems, the

Objet100 is just as good at

printing 1:1 scale casings that can be drilled, assembled, and screwed together as it is at reproducing the precise look and feel of small, complexly-assembled consumer products. The system is easy to use, can work unattended for prolonged periods, and requires only the minimal manpower to operate."

The Objet1000 system offers a choice of over 100 materials, enabling designers and engineers to simulate both standard and ABS-grade plastics. As with all Objet Connex 3D printers, the Objet1000 is also able to print up to 14 different material properties within a single model.

In fact, Objet's range of materials has expanded following the release of a new and improved Objet Rigid Black Material, which provides enhanced dimensional stability and surface smoothness, making it ideal for fine detail, all-purpose rapid prototyping.

Based on the new and improved Rigid Black



The new Objet Rigid Black Material provides enhanced dimensional stability and surface smoothness, making it ideal for fine-detail, all-purpose rapid prototyping





Above: PA 1101 is a natural-coloured polyamide 11 characterised by high elongation at break and impact resistance

Below: The EOS Formiga P 110

Material, Objet also introduces 16 new rigid black and rubber-like Digital Materials (composite materials made by combining Objet Rigid Black and Objet Rubber-like Material).

For Objet Connex systems exclusively, these 16 new 'Digital Materials' enable the simulation of a variety of rigid/rubber-like properties including a higher-toughness material that simulates polypropylene, as well as a range of flexible materials with different Shore A values from 27 to 95.

The new material combinations enable the easy and accurate prototyping of seals and packaging for consumer goods, electronics and automotive parts. Such models require the combination of rigid and flexible properties within a single prototype of consistent black colouring.

EOS, meanwhile, presented the Formiga P 110 at this year's EuroMold. Intended as the successor model to the established and very successful plastic laser-sintering system Formiga P 100, the Formiga P 110 is designed to offer flexible, cost-effective and highly productive entry into the world of laser-sintering. Various EOS parameter sets enable a focus both on economic efficiency and component properties such as surface quality. With short throughput times and comparatively low investment costs, the Formiga P 110 can be integrated perfectly into production environments that require maximum flexibility.

The system is suitable for the economic production of small series and customised products with complex geometries. This makes it ideal for small, sophisticated components used in the medical device industry or for high-value consumer goods, for example. With a build envelope of 200 mm x 250 mm x 330 mm, the

system manufactures products made of polyamide or polystyrene directly from CAD data within only a few hours.

Numerous technical innovations have been integrated into the Formiga P 110, all of which are intended to enhance process stability and reproducibility. These include the new four-channel heating and the use of a single-point pyrometer. At the same time, lowest-cost integration in factories with a central nitrogen supply system is guaranteed by an external nitrogen connection. The established dosing and coating system was retained.



The system is intended to be extremely user- and maintenance-friendly and to require an absolute minimum of accessories. Low energy consumption and thus overall costs of

operation were other important factors considered in the design process. A door-passing laser-sintering system, the Formiga P 110 can, it is claimed, be installed and calibrated in under two days. Since data preparation can conveniently take place at the workstation, the system is also very suitable for decentralised production areas. The high level of automation and ergonomic peripheral equipment of the Formiga P 110 also allow for comfortable handling and the optimum utilisation of machine capacity and materials.

EOS also presented two new materials at Euromold. PrimePart Plus represents a breakthrough in polymer development. The material can evidently be refreshed using only a 30% share of new powder, resulting in a powder cycle with minimum scrap quantities. This improves the cost efficiency and sustainability of the laser-sintering process, since conventional laser-sintering materials are usually refreshed using 50% or more new powder. This does not lead to diminished technical performance of the material and the key performance indicators achieved are only slightly lower than those of PA 2200.

The other material is PA 1101, a natural-colored polyamide 11 which is characterised by high elongation at break and impact resistance with a balanced performance profile. The material is based on renewing resources and can thus be classified positively in environmental terms.

On account of its material properties, the material is particularly suitable for applications with functional elements that require high material ductility (e.g. integral hinges) and ones where high impact resistance is important. Another typical application for this material is for components that do not allow chipping, such as passenger cells in vehicles.

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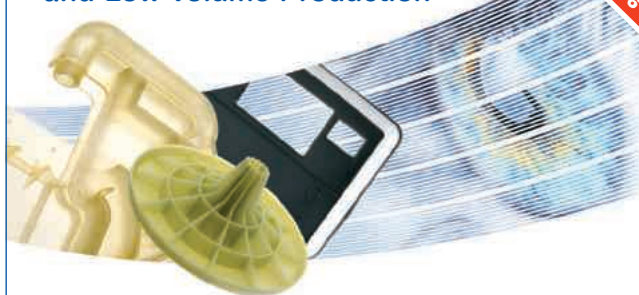


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Avoiding 'conflict minerals'

As the US introduces a ban on some materials from the Democratic Republic of the Congo, what is the potential impact for UK companies? Justin Cunningham reports.

The last decade has seen a variety of legislation introduced to limit and even ban the use of certain materials in products. Manufacturers and designers alike have had to gain a better understanding of the supply chain and the limits being placed on certain substances, as well as dispose of them appropriately at the end of life.

And it has not been easy. The Waste Electrical and Electronic Equipment (WEEE) Directive, Restriction of Hazardous Substances (RoHS) Directive, and the Registration Evaluation Authorisation and restriction of Chemicals (REACH) have been the main ones to grab the headlines but End of Life Vehicles (ELV), the Landfill Directive, and numerous others have all had to be dealt with.

The European Union has taken a lead role in

environmental and ethical legislation when it comes to materials, but it seems that the US has made efforts to keep up of late. Most notably, it has introduced legislation that prohibits its public companies from using certain materials from the Democratic Republic of the Congo.


Officially part of the Dodd-Frank Wall Street Reform and Consumer Protection Act, it is much more commonly known as 'Conflict Materials'. The legislation forces US manufacturers not only to disclose what materials are in a product, but for the first time prove where it is from.

The recently announced US Securities and Exchange Commission (SEC) rules require that in 2013, all US publicly-traded companies must begin tracking for the presence of conflict

minerals in products and determine if the country of origin is the Democratic Republic of the Congo or an adjoining country. Companies must also maintain a documented due diligence trail. Beginning in May 2014, companies will need to report their findings to the SEC. In addition to disclosing whether or not products are 'Conflict Free' to the SEC, they must also post this information on their public websites.

The Democratic Republic of the Congo possesses 80% of the world's Coltan (colombo-tantalite ore), but only mines a fraction of it. When Coltan is refined it becomes a heat resistant powder that can hold a high electric charge. It is therefore a vital component in a vast array of small electronic devices, and is in most mobile phones, laptop computers, pagers, and other electronic devices. Tantalum is also





"You have to report what materials are in your products and now the country of origin... Getting down to the smelter or the mine is significant effort."

ubiquitously used. It can be alloyed with other metals to make carbide tools for metalworking equipment and in the production of superalloys for jet engine components, and is commonly used in automotive electronic components. It also does not irritate the body so is often used to make surgical sutures as well as implants.

"It is an enormous issue for US manufacturers," says Scott McCarley, product marketing director for Windchill Product Analytics at PTC. "We work with a number of companies that appreciate the size and complexity of the legislation, but some of them have been left scratching their heads about how they are going to implement it."

"You have to report what materials are in your products and now the country of origin, not just a restriction but details of where they

come from. Getting down to the smelter or the mine is significant effort."

The Democratic Republic of the Congo has seen significant conflict in the recent years and as a result military groups have taken control of many of the mines. These groups are using natural resources to fund its operations and create a crisis by using forced labour. In addition, there have been documented atrocities.

Similar stories have emerged from some of the countries adjoining the Democratic Republic of the Congo as well. Miners are often forced to dig with hand tools and even their bare hands in squalid conditions for little or no pay.

The United Nations has released reports declaring that the mineral trade in the region contributes directly to the funding of war. As a result the US congress has taken this direct action and said the trade of conflict minerals originating from The Democratic Republic of the Congo must stop.

The conflict mineral law requires public companies to disclose the use of such minerals in any products they manufacture. And this is why it is affecting UK companies. By requiring a big manufacturer to report that information, they in turn have to go down the supply chain to component manufacturers. Anyone supplying in to the US manufacturing industry needs to prove that they are not using conflict minerals.

"The legislation is having a ripple effect," says McCarley. "The obligation is on US manufacturers, but it will affect manufacturers worldwide."

US manufacturers need to report whether or not there are any conflict minerals in products, or if it is indeterminable. If manufacturers are not sure there is a two year grace period. But, it is not the case that those that do not follow the legislation will face heavy fines. The US Government says the naming and shaming of companies that use conflict minerals is enough.

"Companies are obliged to put this information on their websites," says McCarley. "The penalty is that your company will be seen as being unethical in its operations and that is a big part of the consumer decision to purchase these days. So companies will risk seriously

damaging their brand."

The exact materials, and mined minerals affected under this legislation are Tantalum, Tungsten, Tin and Gold – often referred to as 3T&G. Currently in the US, 15% of its Tantalum (used to produce coltan) is from The Democratic Republic of the Congo so it is a significant volume. The other conflict minerals in the US supply chain are Tin (8%), Tungsten (4%) and Gold (1%).

Europe and the European Union is largely waiting to see how the regulation unfolds and how its implementation goes before taking similar steps. The belief, however, is that this regulation will drive many manufacturers all over the world to adopt this standard and it is only a matter of time before this kind of regulation is implemented in the UK.

Is there a solution?

By leveraging full material data retrieved from International Material Data System and a product compliance system, you can systematically generate reports that identify exactly which products, components and suppliers use conflict minerals, as well as demonstrate due diligence.

"We have been working with companies and one of our solutions is product analytics," says McCarley. "The solution is about managing compliance, performance and risk starting early in the product development process."

"You can track regulations like REACH, RoHS, and conflict minerals as well as other performance criteria like cost, quality and even approximate embedded carbon."

The methods and tools available for tracking and managing materials along the supply chain - from production right through to disposal - are continually evolving. Increasingly, however, manufacturers are being asked to document all the materials in products to give greater transparency of who buys what, from where.

This is a trend that will no doubt have a big impact on design. Designers face increasing constraints and if a material becomes too expensive, or indeed no longer viable to use, alternatives must be found.

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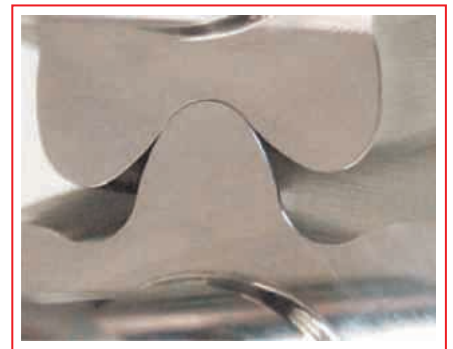


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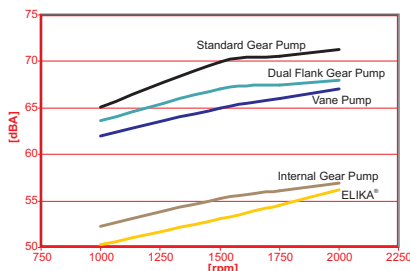
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Electric gearbox cuts costs

A low cost drivetrain that has its heritage in the motorsport industry is being developed and tested for an all-electric inner city van. Justin Cunningham finds out more.

Most people involved with or even interested in motorsport will have come across driveline technology specialist Xtrac. The Berkshire-based company is well known for its innovations in transmission systems and was one of the early movers in pursuing hybrid technology.

Now, however, Xtrac is taking its transmission knowledge and transferring it to a new market in the form of an all-electric inner city van called StreetScooter. The single-speed gearbox and differential has been specially developed for front-wheel drive electric vehicles. It is to soon build an additional 65 transmissions for large-scale appraisal by a major fleet operator prior to commencing low volume series production.

"We are delighted to be a technical partner for this sustainable and affordable electric vehicle," says Clive Woolmer general manager of Xtrac's automotive and engineering business. "We have built three transmissions for test and development and are well on our way to a final validation of the design."

"It was a challenging brief as StreetScooter aims to build a low-cost vehicle in relatively low volumes. The best way to achieve this in the

transmission has been to keep it simple with as few parts as possible, but offering a high level of reliability and durability to minimise operating costs during the life of the vehicle."

StreetScooter is a multi-functional light commercial vehicle for a variety of service industry and trade roles. It features an extended

wheelbase and has a cargo capacity of about 4m³. It is designed for city use and has a power rating of 30-45kW (40-60bhp) generated by a lithium-ion battery and induction motor. The maximum range of the vehicle is around 120km (75 miles) and the maximum speed is 85kph (53mph).





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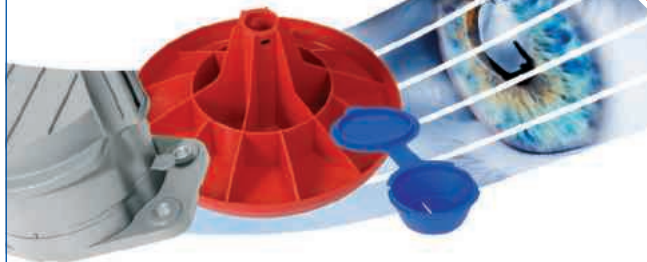
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The vehicle is inspired by the desire to build an electric vehicle that is comparatively priced to conventional vehicles but is also sustainable.

The electric vehicle can be tailored for a variety of roles to suit local tradesmen, utility companies, service engineers, rental firms and larger fleet operations that need to operate quietly and efficiently with zero carbon emissions in an inner city environment. StreetScooter says that operator acquisition and maintenance costs and the total cost of ownership have been given top priority.

Professor Achim Kampker, chief executive of StreetScooter, says: "We are in an excellent competitive position. There is considerable interest in our eco-friendly urban electric vehicle and our ability to customise it on the production line for different trades and commercial vehicle applications."

Xtrac has also recently designed a hybridised automated manual transmission to allow future luxury supercars to meet the 95g/km CO₂ emission requirement being introduced by European legislators in 2020.

The prototype gearbox is aimed at vehicle manufacturers competing in the high-growth sector of premium luxury road cars, which includes limousines as well as supercars. Dubbed the 1010 H-AMT, it has a high torque-carrying capability and uses innovative transverse gear cluster orientation.

Xtrac believes its distinctive transverse transmission configuration lends itself particularly well to hybridisation and offers a compelling solution to the supercar sector's preference for retaining high power, multi cylinder engines while meeting 2020 emission targets. The transmission can handle engine torque capacities ranging from 800 to 1,000Nm dependent on vehicle gross weight and the particular application.

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Pneumatics dispense with complexity

Mechanical systems to dispense small amounts of material are highly complex. Paul Fanning reports on a system that can do the job better.

In large equipment, mechanical actuators are the most cost-effective and best-performing method for displacing liquids or granules. A car's hydraulic braking system, for instance, combines a precise response to the driver's pedal press with extremely robust and reliable operation.

Scale down, however, and mechanical approaches to the displacement or dosing of micro-quantities of materials can become overly expensive, cumbersome and bulky.

However, a device from Varta Microbattery appears to offer a new approach to the problem. This system, it is claimed, requires no electrical power supply and no springs, gears or other actuation components. Far cheaper and easier to implement than electro-mechanical or spring-loaded systems, it promises to open up a radically new approach to the design and assembly of small displacement devices.

The displacement of small quantities of liquid, gel, paste or granules is required in many kinds of industrial and medical devices. It could, for

instance, be used to apply lubricant to the internal parts of an industrial motor, or for dispensing medicine in intravenous drug delivery. When the amounts to be dispensed must be precisely controlled, a conventional mechanical solution will be expensive. This is because the highly precise machining and assembly of miniature mechanical parts is technically difficult to accomplish, and requires expensive manufacturing equipment. A device containing a micro-motor will also require a power source such as a battery, as well as the complex electronic circuitry required to regulate the power supply and to control the movement of the motor.

The H₂ cell from Varta, by contrast, is a tiny, gas-generating device. The same shape as a button (round) battery cell, it can generate a volume of pure hydrogen 270 times greater than its own volume. The V 130 H₂ cell, for instance, is a button cell with an 11.5mm diameter, and a height of 5.4mm, equivalent to a volume of

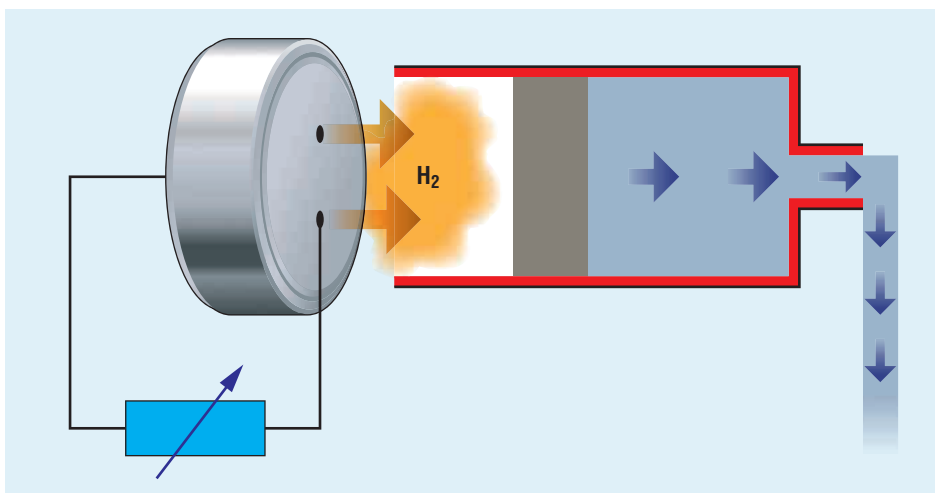
0.55cm³. This tiny device can generate a volume of pure hydrogen of up to 150cm³.

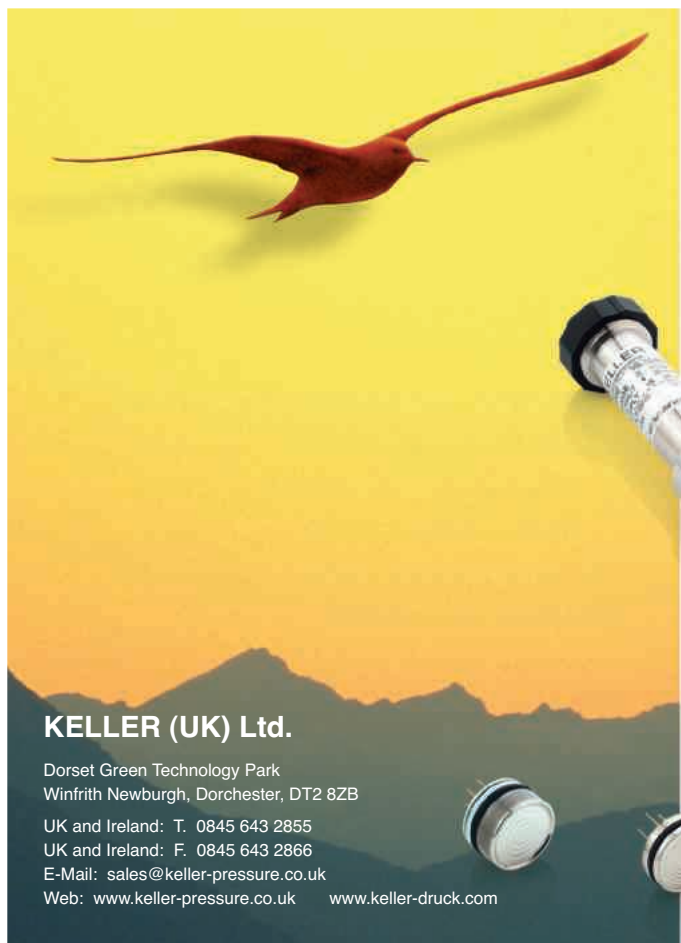
When activated, the cell releases hydrogen through two tiny holes in its upper face. It is activated by being short-circuited – connected to a resistor of a known value. The value of the resistance determines the rate of emission of gas – the lower the resistance, the faster the rate of gas generation. Until activated, the cell is dormant and releases no gas.

When controlled by a resistor of fixed resistance value, the rate of gas emission is fixed. The resistance can, however, also be provided by a variable potentiometer, and this enables the user to adjust the rate of gas emission during operation. The rate is adjustable over a wide range, so the cell can be used over a period as short as some minutes and as long as one year.

When placed inside a gas-tight housing and activated, the cell's release of gas generates pressure. In a device such as a syringe, this pressure will be converted into motive force. Hence an H₂ cell can be used to drive a displacement device, and thus to dispense materials such as lubricants and medicines. A single V 130 H₂ cell is capable of lifting a 10kg weight 10cm in the air when housed in a gas-tight, high-pressure enclosure.

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Games without frontiers

A sensor familiar to many from their games console is increasingly finding a place in real-world engineering applications.

Paul Fanning reports.

While it may be enjoyable, entertaining and pass an idle hour or so, few people would necessarily ascribe the word 'useful' to video game technology. Indeed, the more puritanical might even argue that the employment of so much creativity and technological brilliance on something so frivolous is wasteful in itself.

However, the transfer of technology from gaming to 'real' engineering is an increasingly well-worn path. And nowhere is this more the case than where the Microsoft Xbox Kinect controller is concerned.

For those who are not au fait with games consoles, the Kinect is a motion sensing input device by Microsoft for the Xbox 360 video game console and Windows PCs. Based around a webcam-style add-on peripheral for the Xbox 360 console, it enables users to control and interact with the Xbox 360 without the need to touch a game controller, through a natural user interface using gestures and spoken commands.

Capable of simultaneously tracking up to six people, the Kinect sensor is a horizontal bar connected to a small base with a motorised pivot and is designed to be positioned

lengthwise above or below the video display and has a practical ranging limit of 1.2–3.5m.

Its motion sensing capabilities and relatively low cost make the Kinect ideal for adaptation to other purposes, something that became apparent when, in November 2010, Adafruit

The Kinect has even been employed by Surrey Satellite Technology Limited to create low-cost nanosatellites



Industries offered a bounty for an open-source driver for Kinect. Despite initial misgivings, Microsoft went on to embrace third-party development of its technology, even going so far in June last year as to launch Microsoft Accelerator, acting as a matchmaker between promising start-ups that embed the technology in their products and potential investors.

And there is no shortage of examples of such applications. Last June, for instance, *Eureka* reported on Surrey Satellite Technology Limited's use of the Kinect's sensors to provide low-cost nanosatellites with spatial awareness in three axes, thereby allowing them to align and dock. In turn, the inspiration for this project came from a Kinect-based project at MIT, as SSTL's project leader Shaun Kenyon makes clear. Says Kenyon: "We were really impressed by what MIT had done flying an autonomous model helicopter that used Kinect and asked ourselves 'Why has no-one used this in space?'"

The medical field is another where Kinect has been successfully adapted for a variety of purposes. One recent example was undertaken by the University of Leeds in order to monitor the rehabilitation of patients after suffering strokes.

Currently, a number of technologies exist to track patient movements. However, not only can these systems cost upwards of £40,000 per camera, they have the added disadvantage of requiring the user to wear markers placed on the skin or clothing, and are often significantly more accurate than is necessary, providing no extra insight into patients' movements at a large capital expense. As such, a significant advantage is presented by the development of an easy-to-use, Kinect-based system that can





A project was undertaken at the University of Leeds to monitor the rehabilitation of stroke patients using Kinect

produce similar results at a fraction of the cost.

A system able to record normal camera footage of a patient was developed, alongside a full 3D rendering of the user's skeleton, allowing the operator to rotate and explore the user's movements. This Virtual Instrument (VI) embeds the skeletal data directly into an .avi file. A further VI has been developed that allows this video to be reviewed, chopped up and saved, giving cherry-picked footage of a physiotherapy session, providing a 3D, rotatable rendering of the patient's skeleton, alongside the raw video footage.

Two other uses of this system include during laparoscopies where, using the depth-mapping functionality of the Kinect, the depth from the camera to the abdomen for each pixel in the camera's range is determined. This information is fed into National Instruments' LabVIEW, and processed, using approximations of the geometry of the abdomen, in order to determine the inflated volume, and provide surgeons with a more accurate picture of the intra-abdominal cavity.

Gesture-based manipulation of the .stl files then allows surgeons to manipulate CT scans and 3D models wirelessly without the need to leave the sterile operating environment.

As with stroke rehabilitation, gait analysis is often undertaken via the application of various

sensors to the patient's body, the location of which is then fed into the computer system. This is generally a long and drawn out affair, which may result in patient discomfort. Using the Kinect to track the user's skeleton, gait can be quickly analysed and important metrics concerning the patient can be calculated through LabVIEW and fed back to the operator.

Another fascinating application of the Kinect Sensor came from NSK, a company more usually associated with bearing technology. This was in the form of a robotic guide dog for the blind that uses Microsoft's device to allow it to tackle stairs. The robot converts information gained from the sensor into 3D shape, position and attitude information so that it can recognise the width and number of stairs. Conventionally this was a very difficult challenge, but with a new algorithm, the robot can recognise stairs while in motion for a safe and stable ascent and descent of staircases.

Further proof of the Kinect's transition into the mainstream of engineering comes in the form of an app developed by 3D measurement company Faro. Based on its proprietary scan processing software, SCENE, the company has now developed a new app transforming data from popular motion sensors into 3D models suitable to use in various applications.

The SCENECT app takes the colour images

captured by the Kinect and joins these together to form a complete 3D model. To do this, it also uses the depth information supplied by the device. Using this technology, everyday objects, rooms and figures can be scanned – and it even works on people. Basically there are no limits to users' creativity in their choice of objects to scan. All three-dimensional, stationary objects can be scanned at a distance of 0.8 to 2.5 metres. Dimensions can be taken directly in the three-dimensional data models. Additionally, scans can be exported in various file formats to other software such as CAD programs. It opens almost unlimited possibilities in the 3D scene – for example, in applications including video games, graphic design, visual art, model-making and even 3D printing.

Scans are easy to make with the portable motion sensor. In the first place, the motion sensor is simply connected to a PC or laptop with the SCENECT app. Once the scanning process has started, the Kinect is guided slowly along or around an object. The motion should be constant and steady when doing this to ensure that the colour and depth information is captured. The measuring points form the basis for a point cloud. During scanning, the SCENECT software always displays a video on the monitor to show what the Kinect is currently capturing.

On the display, coloured markings indicate the quality of individual scanning points in the field of vision, thereby helping to capture data as effectively as possible. At the same time, the 3D point cloud for the object is generated and is immediately visible in the other half of the window, allowing the progress of the scan to be observed at all times.

An additional status manager also documents the scan process and uses a coloured field to indicate the overall quality of the scan, which is dependent on the point quality and the scanning speed. In the 3D view available in SCENECT, users can use their mouse and keyboard to turn around inside the room and to view the object from all sides.

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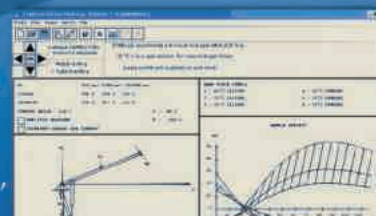
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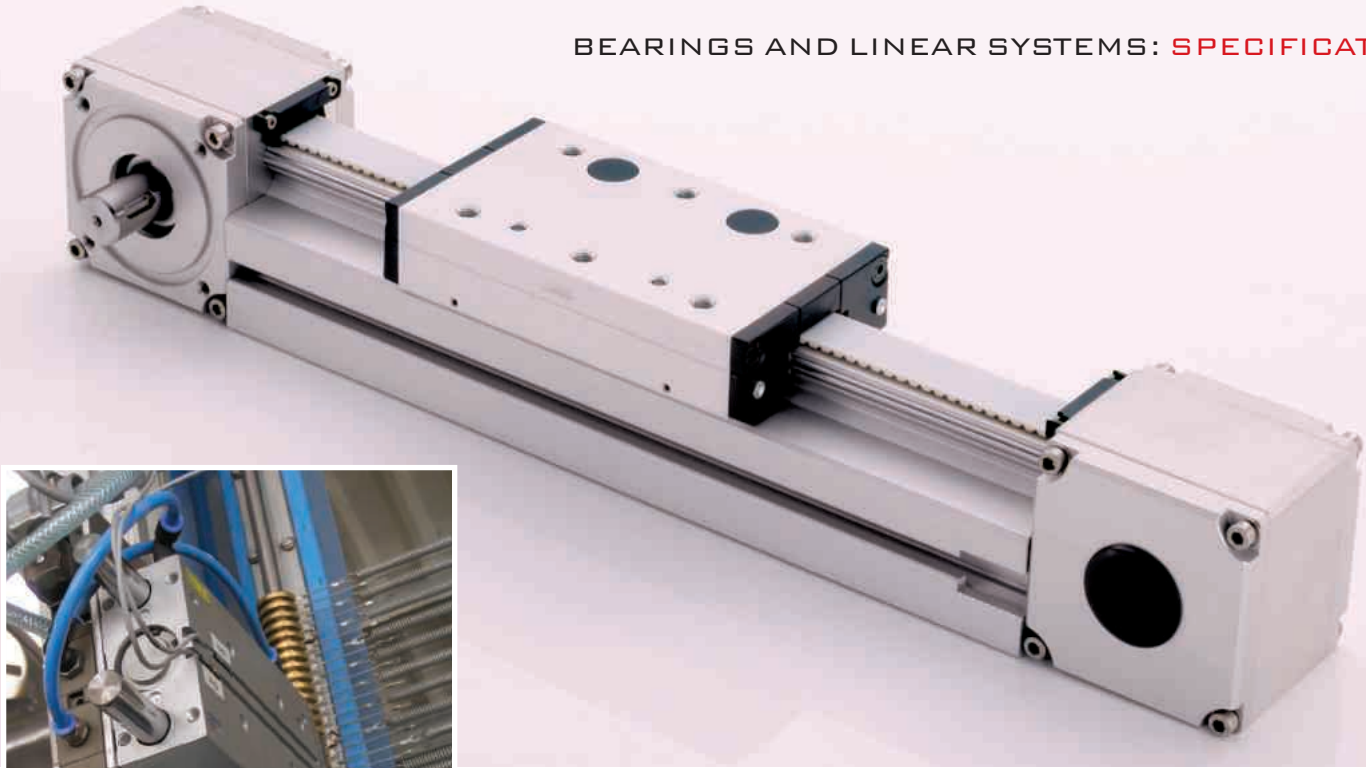


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Straight-up advice

Specifying linear motion systems isn't the black art many engineers believe it to be. *Eureka* gets some useful tips and guidance on the selection process.

Many engineers are still not confident when it comes to selecting suitable linear motion systems. Some avoid linear motion altogether and revert to a more traditional comfort zone, specifying rotary alternatives even when it means over-engineering a solution.

It doesn't help that the terminology can be confusing. Linear systems use a number of methods to achieve linear motion, but the main methods are belt-driven and ballscrew-driven linear actuators. So what do you need to consider when starting out?

"System configuration, including the number of axes of motion, is often the first factor that needs careful thought," says Mike Hughes, an applications engineer at Schaeffler UK. "The most common are two-axis (X-Y) configurations, but single-axis and three-axis configurations are also possible.

"System orientation and mounting are also key factors. In a single-axis linear system this is fairly straightforward, but in a multiple-axis

system it becomes more complex. Factors to consider include: the direction of travel in each axis; whether the load need to be moved simultaneously in multiple axes or if each axis moves individually; and does the system require a standard moving carriage or a moving rail? Also, consider if the axes are vertical, horizontal or inclined and if the mounting positions of each actuator is 0, 90 or 180° to the horizontal."

The mass and geometry of the object to be moved and the position of its centre of gravity as it moves relative to a co-ordinate or datum point on each axis must also be calculated. Clearly, as a mass is accelerated or decelerated along multiple axes of travel, the position of its centre of gravity relative to each axis will change. This needs careful consideration so that the moment loads at multiple points in the system can be established. Calculating the best and worst-case scenarios using specialist design calculation software – such as Schaeffler's Linear EasySolution – is sufficient

for most applications.

"The effective and total stroke length for each axis is also critical," says Hughes. "With ballscrew-driven linear actuators, for example, the stroke length is limited to the length of the ballscrew itself. Therefore, maximum stroke lengths tend to be around 3m. But with belt-driven systems, there are no such restrictions and stroke lengths can be as much as 20m if required. If linear motors are specified, in theory, stroke length is unlimited. However, in reality lengths above 10m are rare."

Accuracy and repeatability will differ greatly depending on the application. As a rule of thumb, typical off-the-shelf accuracy of a ballscrew-driven linear actuator is 0.16mm per metre with repeatability of ± 0.01 mm, and for belt-driven actuators typical accuracy is around 0.5mm per metre, with repeatability of ± 0.10 mm.

The true limitation for traverse speeds and times is essentially contained in the bearings of the ballscrews. Typically with ballscrew-driven





actuators, maximum speed is around 3m/s. For belt-driven actuators with track roller guidance systems the maximum speed can be as much as 8-9m/s.

"Acceleration itself is not normally a defining issue in multi-axis positioning systems," says Hughes. "It is the load due to acceleration that is critical. The highest acceleration of any linear actuator to date is around 40m/s² although typically accelerations are likely to be less than this, often between 0.5m/s² and 5m/s². Deceleration is also important, particularly if emergency stops are required."

Additionally environmental factors such as temperature, humidity and contamination – i.e.

dust, oil, water, washdowns, chemicals and coolants – will also affect the choice of linear systems. A dusty working environment may require external bellows or dust extraction devices. Linear actuators can be protected from the environment by incorporating special seals, corrosion-resistant materials and coatings, special greases or by using plastic parts where necessary.

Additionally, for some applications the overall noise of a system may be a factor that needs addressing. A lower-speed linear actuator may be a solution here, but if high speeds need to be maintained, special components, materials or coatings can be specified in order to keep noise levels to a minimum.

As with Schaeffler, green engineering is an important element of the development work at NSK. It has increasingly had customers demanding low-noise for linear systems as well as a number of other key attributes such as

ultra-steady running, high precision and ever-increasing output.

Machine manufacturers often use ballscrews when linear movements have to be performed with a high degree of precision and quiet running. NSK produces miniature linear drives with a spindle diameter of just 4mm for hand-held medical applications to larger high-load drives for injection moulding machines with clamping forces of several hundred tonnes.

As ever more specific requirements are being made of drive systems, the working relationship between manufacturers and users is primarily changing in situations where high-end solutions are needed. Like Schaeffler, NSK is seeing an increase in joint development projects with machine manufacturers.

The company collaborated with a manufacturer of servo drives and a producer of injection moulding machines to develop a drive system for an ejector unit that is capable of extremely high dynamic axial forces. This utilises heavy-duty spindles from the HTF series, which feature an optimum ratio between the balls diameter and a patented ball guidance system that prevents direct ball-to-ball contact. Together with the material specifications for the nut, ball and spindle, these design features pave the way for very high speeds and peak-load capacities.

Bespoke systems have also been developed for handling technology and related areas. A producer of an electric drive system used an NSK ballscrew at the heart of its highly stressable servo-electric linear drive to replace an existing hydraulic drive. Here, the environmental footprint was a key criterion along with precision.

Users of ball screws and linear guides want more from their suppliers than just a broad portfolio of high-quality, durable products. They want engineering support when the catalogue range does not fit their specific needs. They are also increasingly looking at the environmental impact of drive systems and taking this aspect into account when machines and plants are developed.

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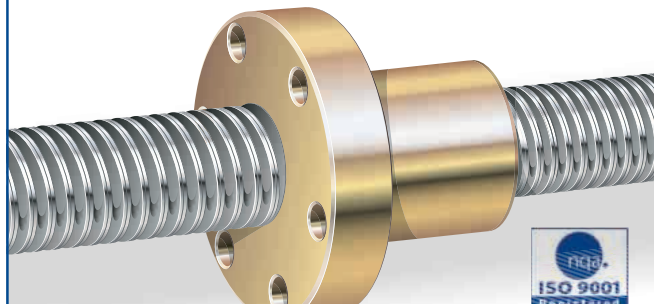

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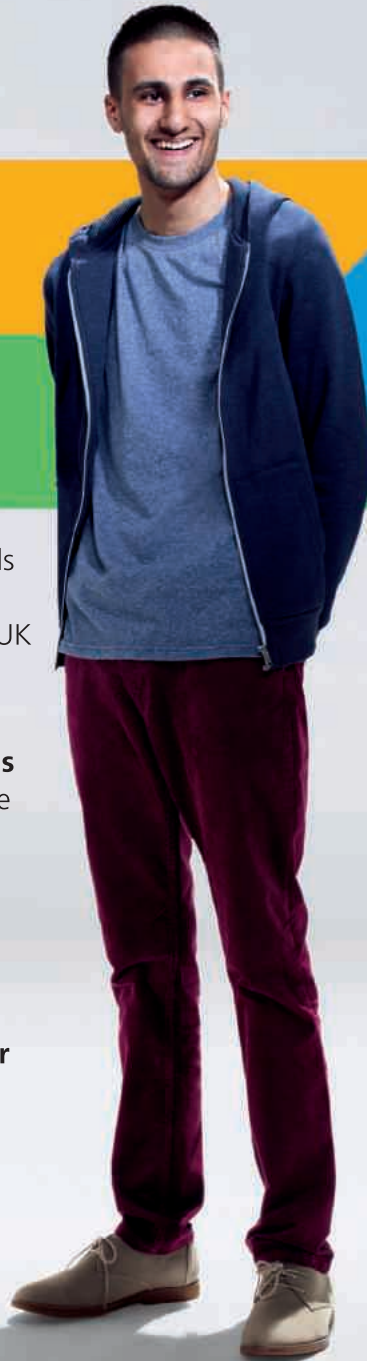
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Are you ready for the Patent Box?

The government will shortly launch the Patent Box tax system. Here, Anthony Albutt, partner with leading intellectual property law firm D Young & Co LLP explores some of the developments and provides a reminder of what's on offer.

On 21st March 2012, the Chancellor confirmed his commitment to a UK 'Patent Box' in the budget. As of 1st April this year, it provides for a reduction in tax from 23% to 10% for intellectual property based profits.

Readers may have seen the statement from the CEO of pharmaceutical giant GlaxoSmithKline saying, "The introduction of the patent box has transformed the way in which we view the UK as a location for new investments". The Patent Box scheme is not just for the big companies; it might be of significant value to your company too.

Over the last year, a number of changes have been made to the Patent Box legislation in the 2012 Finance Bill, some of which are outlined below.

The most significant change is that the legislation now includes income from licences for a patented invention in a country that is not covered by the qualifying patent. As a law firm who pointed this discrepancy out to the Treasury, we are delighted to see that it has now been corrected. Hence for example it is now possible for a UK company to include income from licencing an invention in the US, providing it also has a UK or European patent. This is in contrast to the original legislation that appeared to limit licencing to just the qualifying patents themselves. Clearly, this change is excellent news for UK firms whose business receives income on licencing overseas.

Other notable points in the final legislation are the confirmation that in addition to patents, the Patent Box extends to Supplementary Protection Certificates, granted secret applications, UK and European plant breeders' rights, and for products also extends to certain marketing protection rights for medicines, and data protection rights.

The Government has also extended the



patents qualifying for the Patent Box to those from a number of European states, the most notable being Germany. In practice it is unlikely for a UK company to have a German national patent and not a UK or European patent, so the advantages of this provision may be limited. Nevertheless, it still expands the scope of the scheme.

Finally, further changes to the legislation include a simplified profit calculation for small businesses and an increase in the threshold on total profits from £1m to £3m. The provisions for SMEs are intended to make the system additionally attractive to small businesses, and the maths seems to back this up as shown in the following example:

Assuming a 10 year product life, and even with a rather conservative estimate for the cost of filing, granting and maintaining a patent, if you make more than just £1,000 per month in profit from a patented product or licence, you are likely to be comfortably better off under the Patent Box scheme. These numbers make interesting reading.

Moreover, the scheme is generous with what products are eligible: for example, a patent for a printer cartridge will make eligible profits from the sale of a printer incorporating that cartridge, and

(perhaps more importantly) a patent for the printer makes eligible profits from the sale of a cartridge for that printer. As a result, the scope for identifying patentable products and subsequent profits is very broad.

So, practically what should you do?

First, look carefully at your products and identify the technical features that distinguish them over what is known. Most products do have some kind of distinguishing aspect or feature.

If you focus a patent application narrowly on these features it is likely that the patent will grant quickly and easily. Perhaps most importantly, getting it to grant will cost you less. It is also worth noting that the UK Patent Office has remarkably low government fees. The overall cost of obtaining a UK patent need not be significant and should not therefore prohibitively eat into the savings.

Consequently, in parallel with a strategy of broad patents designed to prevent competitors entering your market, it is also now worth looking at narrow patents that protect specific features. In fact, many companies are looking at their income stream and products and are seeking advice on narrow patents solely for the purpose of exploiting the Patent Box.

The corporation tax savings are potentially considerable; particularly so if you make money from overseas sales. It is a simple calculation; does the corporation tax saving outweigh the cost of obtaining a UK patent? For a 10% corporation tax rate I'd say it is worth doing the maths.

For more information, please contact Anthony Albutt, Partner, on:
Tel: 020 7269 8550
Email: aja@dyoung.co.uk www.dyoung.com

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INTELLECTUAL
PROPERTY

Adhesives

Low Pressure Hot Melt Adhesive Moulding

Superior sealing, better protection of electronic/electrical components and higher productivity are the benefits of Henkel's Macromelt moulding. It's a highly cost-effective alternative to epoxy potting and also a low pressure process so breakages are minimised; one PCB manufacturer virtually eliminated a 65% reject rate by switching to this method.



www.loctitesolutions.com

@: technicalservice.loctite@henkel.com
 ☎: 01442 278100

Batteries

Bike battery secured by Camlock Systems

Varta Microbattery's bikes are provided with electronically-controlled battery packs. The battery compartments are secured with pushlocks manufactured by Camlock Systems.

Varta Microbattery GmbH is a manufacturer of retail and OEM batteries. One of Varta's business divisions is CellPac BIKE which produces electric bikes (or 'pedelecs') fitted with a lightweight battery.

The battery compartment is secured with Camlock's 3015 pushlock. The 6 disk tumbler lock provides good security. It has a push-to-lock action, a 45° locking movement and the user-friendly double entry key is trapped in the unlocked position. A sprung horseshoe clip helps Varta to achieve fast mounting.



www.camlock.com

@: Rebecca.Koch@camlock.com
 ☎: +44 (0)1323 410996

Bearings

Investment keeps British bearing manufacturer ahead

A £4M investment by its parent company Kaydon Corporation has allowed Cooper Roller Bearings to extend its capability in the manufacture of bearings and housings, including made-to-order split roller bearings and position the company as a single-source supplier in these areas.

The investment has been used to purchase new turning/grinding centres and lathes that extend the size of bearing that Cooper can manufacture, increasing its efficiency and flexibility, maintaining quality and helping it to drive down its already impressive lead times.



www.kaydon.com

@: coopermarketing@kaydon.com
 ☎: +44 (0)1553 767677

Coatings

WS2 Stops galling of SS and Titanium

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

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

Design Out maintenance problems with WS2!



www.ws2.co.uk

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 ☎: 01430 861222

Gearboxes

Norbar Launch Two best-in-class Gearboxes

Norbar Torque Tools is proud to announce the launch of its HandtorqueTM HT-92 and HandtorqueTM HT-119.

Ideal for bolt tightening in confined spaces such as wind turbine towers, both the HT-92 and HT-119 combine new materials, better traceability and are the newest additions to Norbar's new Compact Series of Handtorque TM Multipliers.

Key features of the multipliers include a stainless steel body, a calibration certificate, compact dimensions, lower weight and higher torque output.

In comparison to the closest existing model from Norbar's current range, the HT-30, the HT-92 is smaller in diameter (92mm versus 108mm), lighter (5.4 kg versus 7 kg) and has a 1000 N.m higher torque output at 4000 N.m.



www.norbar.com

@: enquiry@norbar.com
 ☎: 44 (0) 1295 270333

Inserts

Moulder of Plastic Components Improves Production Efficiency with Spirol

A specialised moulder of chrome plated plastic automotive components has improved production efficiency and enhanced the quality of the final product with the assistance of Spirol Industries. This has been achieved through the use Spirol Series 28 headed brass inserts and Spirol's Model HA Automatic Heat Insert Driver to replace the existing steel insert and method of installation. The existing process called for installation of a steel threaded insert into various door handle covers after the moulding process. The steel insert was manually installed using an induction heating unit and a simple press. The process was extremely slow due to manual loading and the poor thermal conductivity of the steel insert. In addition, if the operator unloaded the assembly too quickly before the insert cooled, it would float out of position in the molten plastic. This process yielded erratic performance results with production times running at approximately 30 seconds per assembly and a scrap rate was 8%.



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Lighting

Thorlux and Sapa Profiles Make a Bright Partnership

Thorlux Lighting has designed a new luminaire specifically for industrial and warehouse applications. The new light fitting uses LEDs as the light source as opposed to the conventional sodium, mercury discharge, or fluorescent lamps, as they have a longer life span and therefore have lower maintenance costs. Thorlux's new product, the SOLOW LED, has a projected 100,000 hour life, compared with the typical 25,000 hours for traditional lamp sources. Because traditional lamps need to be replaced more frequently, associated maintenance costs are increased. To achieve the projected life, Thorlux has designed the luminaire so that every component is operating within critical temperature limits. The luminaire is built with two aluminium extrusions from Sapa Profiles, which allowed Thorlux to build in a number of design features that address specific issues for the product's application. The extrusions are designed and fitted together so a hinge runs along the length of the luminaire. The new Thorlux light fitting uses aluminium extrusions so the luminaire can be produced in three different lengths. The shortest version is 1.1 metre in length and uses 68 LEDs and consumes 140watts. The longest is 2.1 metres long, uses 136 LEDs and consumes 275 watts. Although LEDs are only small they generate a lot of heat. This is an important technical consideration to take into account when designing and aluminium is integral to the solution. The thermal properties of black anodised aluminium have been utilised in the design of the aluminium extrusion to conduct heat away from the LEDs and electronic drivers associated with them. One of the extrusions has large fins to increase the surface area and dissipate heat and as the environment that the luminaire will be used in is particularly prone to dust, the fins point downwards to avoid the accumulation of dust which could thereby reduce the fins' effectiveness.



www.sapaprofiles.com/uk

@: marketing.profiles.uk@sapagroup.com
 ☎: 01773 872761

MP3 Annunciator

Slim is in

The MP3 annunciator BSV from PATLITE features high performance in a compact body

With an installation depth of only 19.9 millimetres, the slim PATLITE MP3 annunciator requires very little installation space.

The new annunciator BSV features a slim design and powerful performance. It achieves a sound volume of 87 dB (at a distance of 1 metre) with a power consumption of only 3.5 watt. A volume control allows adjustment of the signal strength to the environmental conditions in intervals of 1dB.

Easy installation – The BSV can either be wall- or flush-mounted. The patented mounting system makes it possible to install the PATLITE MP3 annunciator even in case of access from the front only. That means more flexibility in choosing the position and also saves time during installation.

@: info@patlite.eu

☎: +49 (0) 811 9981 9770-0



www.patlite.com

Monitors

Air In-Leakage Monitor

Power Station Heat Cycle continuous monitor

Chell's AIM-100 provides immediate warning of poor power generating plant condenser performance due to air ingress, tube fouling or extraction plant inefficiency. Continuous data is output, quantifying and trending air ingress level, providing temperature indication on tube fouling & absolute pressure on deteriorating pump performance. Poor condenser performance is the biggest single cause of generating cycle inefficiency and, if left uncorrected, will lead to the loss of several million £'s worth of additional fuel costs each year.

Side-effects of air ingress include increased levels of dissolved oxygen in the water being returned to the boiler, accelerating corrosion and it also raises turbine backpressure often leading to water droplet formation in the turbine causing blade erosion & further loss of efficiency.

@: info@chell.co.uk

☎: 01692 500555



www.chell.co.uk

Rotary Atomiser

Fine Droplets without High Pressure

The small electric rotary atomiser produced by Newland Design is an efficient way of creating small, consistently-sized droplets by means of high-speed rotation alone, without need of compressed air or any high pressure.

The Newland Atomiser rotates a small porous plastic cylinder at speeds up to 35,000 rpm and emits droplets of less than 40 micrometres in diameter.

Applications include:

- Humidification, Moisturization, Evaporative Cooling
- Gas scrubbing and Odour Control
- Dust suppression
- Emulsification.

Flow rates up to 20 litres per hour. Power input 10 - 25 Volts DC, consumption less than 40 Watts. Evaluation units always available.

@: newland.design@btconnect.com

☎: 01524 733 424



www.newlanddesign.com

Sensors

NEW WiFi Temperature Monitoring Sensors

With audible alarm indicators and WiFi capabilities, the EL-WiFi range are the ideal ultra compact temperature and humidity monitoring device. These accurate and versatile sensors will automatically transmit air temperature and humidity data without disturbing the environment in which they are placed. Temperature data is then wirelessly streamed live to your PC. No need for cables.

The free software enables the user to customise high and low alarms plus data transmission times. An audible alarm warning will indicate as soon as temperatures reach above or below the selected settings. The received data can be immediately displayed in graph format or transferred into other applications.

@: info@corintech.com

☎: 01425 655655



www.corintech.com

Sensors

New cost effective and flexible ETP temperature sensor range covers all bases for mounting and measurement

Variohm EuroSensor has released its new ETP range of temperature probes based on a MEAS thermistor. To suit the broadest range of industrial, automotive and scientific applications for precision temperature measurement, four basic packaged design types are available that each offers a choice of options. The four designs conveniently mount the industry standard thermistor in a choice of Ø 4 mm PTFE or Ø 5 mm brass housings, ring terminal probes, or hexagonal head bolts. Within each packaged design, a standard off-the-shelf stock version is available with a 10K3 sensor fitted and the comprehensive list of optional features offered for each type include; housing diameter and length for the cylindrical probes, ring terminal mount diameter/size, and metric thread size for the hexagonal bolt version. The leadwire length for all types is similarly specifiable.

@: sales@variohm.com

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www.variohm.com

Signal Filters

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Terminals

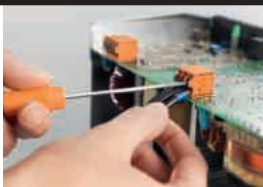
Weidmüller launches new, compact OMNIMATE® Signal LMF PCB terminals with innovative PUSH IN connection system

Weidmüller's new, compact OMNIMATE® Signal LMF PCB terminals with the innovative PUSH IN connection system meet the stringent design requirements of industrial devices needing a reliable power supply connection system. These requirements include a 250V voltage supply, high electrical safety for the insulation material and access to cable wiring to suit the relevant application.

The PUSH IN connection system results in valuable time savings and features an integrated test point and variants with 90° and 180° conductor outputs, allowing for designs with different wiring direction configurations. The LMF PCB terminals are available with 5.0mm and 5.08mm grid dimensions and as 2 to 24 pole versions.

@: marketing@weidmuller.co.uk

☎: 0845 094 2006



www.weidmuller.co.uk

Unisex Travel Razors

Star delivers close shave for unisex travel razor

Star Prototype has helped turn an innovative idea for a unisex travel razor into a commercial product for the discerning traveller by delivering the key elements of Cormia Design's new Pocket Razor.

STAR's brief was to develop the tooling and parts for the TSA approve Pocket Razor. The job included producing a cover made of Aluminium 6063, which was created using extrusion processing, developing 15 different cover samples and then cleaning and coating the chosen satin finish, and producing the razor by die casting with ADC12. In total STAR delivered 500 parts that enabled the product to come to market in time for Christmas.

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www.star-prototype.com

Cane and able

The white cane has a long history as a friend to the visually impaired, but surely we can do better?



The white cane has been an aid to the visually impaired for so long that it has entered the lexicon, becoming a sort of shorthand to denote the disability.

The white cane's role in this regard began in 1921, when James Biggs, a photographer from Bristol who became blind after an accident and was uncomfortable with the amount of traffic around his home, painted his walking stick white to be more easily visible.

In 1931 in France, Guilly d'Herbement launched a national white stick movement for blind people, with 5,000 more white canes later sent to blind French veterans from World War I and blind civilians, while in the United States, the introduction of the white cane is attributed to George A. Bonham of the Lions Clubs International. In 1930, a Lions Club member watched as a man who was blind attempted to cross the street with a black cane that was barely visible to motorists against the dark pavement. The Lions decided to paint the cane white to make it more visible.

However, while the white cane has done sterling service for the better part of a century, it is nonetheless a relatively primitive aid with severe limitations. For instance, it can only



track obstacles in a very limited range and offers little help against moving objects. Equally, the cane can only guard against objects at the height at which it is wielded, providing no warning of overhanging objects such as tree branches.

Of course, for many of the visually impaired, guide dogs can perform this service. However, guide dogs are not available to everyone, are expensive to train and cannot be used by those who suffer from certain allergies.

Of course, one suggestion might simply be a longer stick. However, this is impractical, unwieldy and likely to cause a danger to other pedestrians.

The Challenge

What is needed, then, is a white cane that offers more than simple tactile feedback to the user, giving them information about what's ahead of them in the range beyond the stick itself. Equally, something is needed that can offer information about everything that is likely to cause an obstacle or endanger the user.

The solution we have in mind is simple, elegant and effective, while at the same time being quite inexpensive. It offers a safer and more comfortable life for millions of visually impaired people. However, who can say your solution won't be better?

The answer to last month's Coffee Time Challenge, how to make drinking easier for the disabled, is in our Technology Briefs section on page 14

Experts in sensor innovation

If you are searching for a high accuracy, robust, intelligent sensor for your application, we are sure we have the solution.



Mechanical Design/ Project Engineer

Location: Milton Keynes

Type: Permanent

Salary: £40k per annum

Job Details:

- To work as part of the research and development team, developing and building solutions for specific problems
- To work with applications to understand the nature of the problem to be solved and the product requirements
- Provide additional resource to R & D, as and when required.

This position will see the design through to actually building the products themselves.

Qualifications & Experience:

- Degree or equivalent in Mechanical Engineering
- Strong mechanical design skills, particularly with regard to small mechanical systems and automated handling
- Working knowledge of 3D CAD (Solid Works)
- Proficient in MS Office applications, such as Word & Excel.

Desirable:

- Experience of using paper-handling machines
- Knowledge of materials
- Experience of Design for Manufacture.

For full details online, enter reference: MechDes100113

CAD Design Engineer (Mechanical)

Location: Longbridge

Type: Permanent

Salary: £32k-£35k per annum, plus benefits

Reporting to the Regional Design Manager, the successful candidate will be working on M&E construction projects predominately in the water/waste water industry for a national mechanical, electrical, instrumentation, control and automation (MEICA) contractor, offering a range of high quality waste water and water treatment products and systems.

The main duties include:

- Working from P&IDs and layouts to design new installations
- Pipework detailing and drawings
- Structural steelwork GAs
- Co-ordinate and liaise with other internal and external mechanical, electrical, civil designers, subcontractors and suppliers.

Skills and qualifications required include:

- AutoCAD 3D Experience essential (AutoCAD Plant 3D, Autodesk Inventor etc.)
- Experience in a process industry design role
- Mechanical Engineering qualification – NVQ, HNC, HND, Graduate.

For full details online, enter reference: DesEng100113

Mechanical Design Engineer

Location: Northampton

Type: Permanent

Salary: £35k per annum

As an industry-leading organisation in the design and manufacture of suspension systems within the automotive industry, this company is seeking a Mechanical Design Engineer, who will enjoy a challenging and rewarding working environment.

The main day-to-day role will be to prepare and issue drawings, specifications and parts lists to support production programmes and new product development plans.

Major Responsibilities to Include:

- To create and maintain part, assembly and general arrangement drawings, using SolidWorks Computer Aided Design (CAD)
- Carry out Finite Element Analysis (FEA) studies on structures for stiffness, strength and life, using Ansys Workbench

Qualifications to Include:

- BEng Mechanical Engineering or equivalent
- 3 years' minimum postgraduate experience, preferably within the automotive (truck/trailer) industry.

For full details online, enter reference: DesignEng100113

Senior Design Engineer/ Design Engineer

Location: Sunderland/Durham

Salary: £30k-£45k per annum, DOE

This company, based within the pressure vessel industry, is currently looking to add to its team with a Senior Design Engineer or Design Engineer, with relevant industry experience.

The successful candidate will be required to design and develop a range of storage vessels and any other associated projects.

Candidates with design experience, including AutoCAD and Inventor, will be preferred, as would candidates with a background of designing pressure vessels or products of a similar nature.

Desirable characteristics also include candidates with experience of:

- Finite Element Analysis (FEA)
- 3D software packages
- Knowledge of SAGE.

For full details online, enter reference: SenDesEng100113



Adam Hartles
Elite Applications Engineer

"Massive respect to Adam, not only for his knowledge of the software but his patience as well."

**Simon Levett, Managing Director,
Sim-Tech.**

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