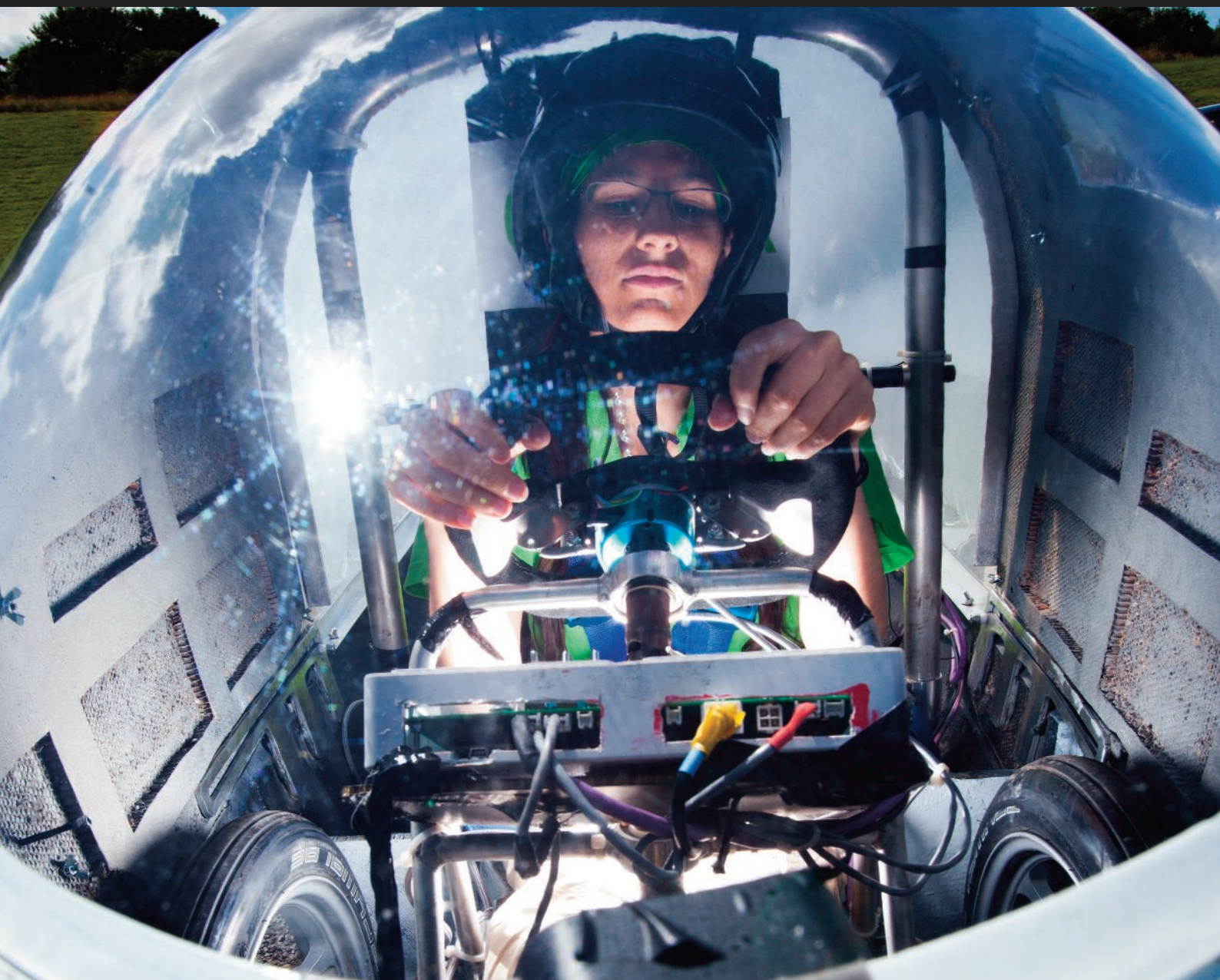


EUREKA

THE MAGAZINE FOR ENGINEERING DESIGN

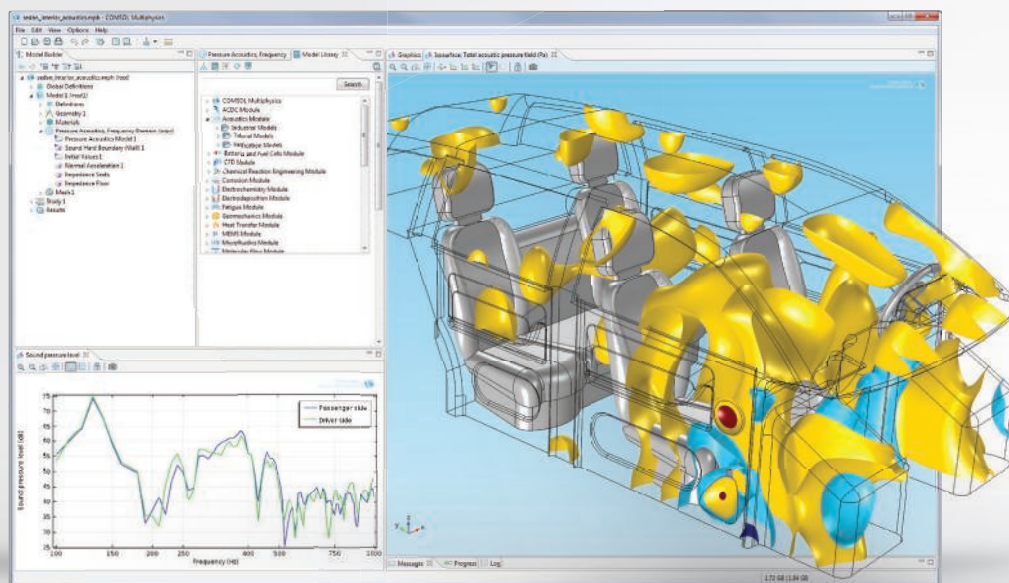
In this issue: Motors, Fastening & Adhesives • Materials • Design Software • Automotive



Running on sun

The changing face of
solar-powered transport

ACOUSTIC ANALYSIS: This model simulates the acoustics inside a sedan and includes sound sources at the typical loudspeaker locations. Results show the total acoustic pressure field and the frequency response at points inside the cabin.



Verify and optimize your designs with COMSOL Multiphysics®

Multiphysics tools let you build simulations that accurately replicate the important characteristics of your designs. The key is the ability to include all physical effects that exist in the real world. To learn more about COMSOL Multiphysics, visit www.uk.comsol.com/introvideo

Product Suite

COMSOL Multiphysics

ELECTRICAL

AC/DC Module
RF Module
Wave Optics Module
MEMS Module
Plasma Module
Semiconductor Module

MECHANICAL

Heat Transfer Module
Structural Mechanics Module
Nonlinear Structural Materials Module
Geomechanics Module
Fatigue Module
Multibody Dynamics Module
Acoustics Module

FLUID

CFD Module
Microfluidics Module
Subsurface Flow Module
Pipe Flow Module
Molecular Flow Module

CHEMICAL

Chemical Reaction Engineering Module
Batteries & Fuel Cells Module
Electrodeposition Module
Corrosion Module
Electrochemistry Module

MULTIPURPOSE

Optimization Module
Material Library
Particle Tracing Module

INTERFACING

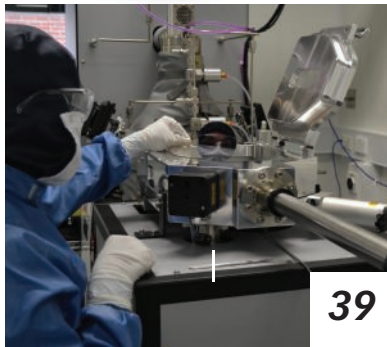
LiveLink™ for MATLAB®
LiveLink™ for Excel®
CAD Import Module
ECAD Import Module
LiveLink™ for SolidWorks®
LiveLink™ for SpaceClaim®
LiveLink™ for Inventor®
LiveLink™ for AutoCAD®
LiveLink™ for Creo™ Parametric
LiveLink™ for Pro/ENGINEER®
LiveLink™ for Solid Edge®
File Import for CATIA® V5



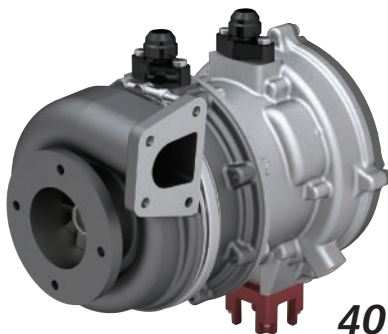
16



27



39



40

16 Cover Story: Run for the sun

The solar-powered car may seem like a pipe dream, but for a team from Cambridge University, it is very much a reality. Paul Fanning reports.

20 Interview: Mandy Savage

Synonymous with innovation, Lockheed Martin has been steadily growing its presence and capability in the UK. Justin Cunningham talks to its engineering director, Mandy Savage.

23 The motor way to premium efficiency

With motor efficiency regulations in place and with more to come, what can the market offer? Paul Fanning finds out.

27 A permanent route to efficiency

Engineers could realise significant cost and energy savings with a new compressor thanks to the introduction of an innovative permanent magnet motor. Paul Fanning reports.

29 Let's torque fasteners

The Phillips fastener head is perhaps the most famous in the world. So what can the company come up with next? Justin Cunningham finds out.

33 Fixing the composite question

Composites present particular challenges when it comes to using fasteners. Here, *Eureka* looks at the way in which one company is addressing these issues.

35 Designing out cost

Software that allows engineers to identify early in the design process the cost of components and suggests areas for improvement can make a big difference. Justin Cunningham reports.

39 Growing nano applications

A light-absorbing carbon nanotube coating is set to enable space instruments to become much more powerful. Justin Cunningham finds out how.

40 Growing innovation

Getting automotive technologies to market requires funding that is hard to justify to potential investors. So how can potential start up companies be successful? Justin Cunningham finds out.

5 Comment

Change at the drop of a hat

6 News

Science Minister opens new Bloodhound HQ

Vince Cable and MIA welcome racing investment

3D printed cast the future

3D printers may be harmful at home

Willetts announces funding for 'great technologies'

Engineering Design Show – Conference Programme Finalised

10 Technology briefs

Torque transmission in challenging environments

Mini short-range sensor

High-speed torque testing sensor

Pressure sensor range expands

Stepper worm gearbox drives added to Astrosyn motor range

Flowmeters monitor viscous flows

46 Coffee Time Challenge

This month's challenge is to find an effective way to cut down on background noise in restaurants.

www.eurekamagazine.co.uk

How high are your measurement standards ?

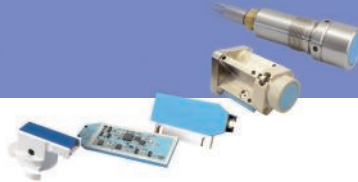


In today's challenging environments every μm matters!

Micro-Epsilon keeps ahead of current measurement challenges and takes sensor technology to new heights. Providing a comprehensive range of high precision, customised sensors and measurement systems, the sky, really is the limit. We've even conquered space!!



- Dimension, position, displacement, thickness, temperature and colour
- Extreme precision and resolution
- From nanometres to kilometres
- Highest measuring rates
- Excellent temperature range & stability
- Ethernet, EtherCAT, serial and analogue interfaces
- Wear-free, robust and extremely reliable
- Market leading price-performance ratio



With more than 45 years' experience, Micro-Epsilon understands the importance of providing complete measurement solutions and support services for its customers. Whether it's inspection, test or sensor integration, Micro-Epsilon gives your company innovation and technical advantage.

DSEI
Visit our experts at
DSEI, 10-12 Sept.
Stand N3-275

+44 (0) 151 355 6070 | www.micro-epsilon.co.uk

Change at the drop of a hat



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

Of the press releases to have crossed my desk in the last week, one immediately struck a chord with me, touching as it did on a particular bugbear of mine. It came from Sainsbury Management Fellows, which has come up with what it calls the 'Hard Hat Index'.

SMF argues that the prevalent use of hard hats in media images to define engineers is not only inaccurate, but undermines their role as "creative problem-solvers who improve lives and shape tomorrow's world". SMF conducted media analysis over 12-18 months to support this claim and found that, during the monitoring period, 185 images of engineers wearing hard hats featured in 16 engineering titles (118 advertisements and 67 editorials, while 940 such images featured in national newspapers (88 adverts, 682 editorials).

There is nothing wrong with wearing hard hats, of course. Often the law requires their use, in fact, which is why we sometimes have to use images of people wearing them in magazines. However, for them to be symbolic of engineers is nonsensical. On factory or site visits, I've had to wear a hard hat many times. No-one would associate hard hats with journalism – and yet I've probably worn one more than many of the engineers reading this.

The image is pernicious, though. I've lost count of the number of times I've seen stories designed to offer a positive image of engineering, only for all the good work to be undone by a picture featuring someone in a hard hat or – even more egregiously – wielding a spanner. And while we're at it, can we also have a moratorium on stories in the national press concerning manufacturing and/or engineering and featuring a photograph of someone welding?

If this seems like an overreaction to a few pictures, it's worth bearing in mind the effect such images can have. SMF also undertook a YouGov poll as part of its research that revealed that, of 2,000 people asked what items they thought engineers primarily wear on an average working day, the hard hat came top with 63% of the votes, whereas a business suit received 25%. Equally, when asked where engineers worked, building and construction sites came top, followed closely by industrial sites, with offices only coming fifth.

Clearly, these perceptions are difficult to shift and the media sometimes doesn't help. However, engineering as a whole needs to be more protective of its image if it is to encourage more people into the profession.

Editor
Paul Fanning
pfanning@findlay.co.uk

Deputy Editor
Justin Cunningham
jcunningham@findlay.co.uk

Web Editor
Laura Hopperton
lhopperton@findlay.co.uk

Group Editor
Graham Pitcher
gpitcher@findlay.co.uk

Art Editor
Martin Cherry

Technical Illustrator
Phil Holmes

Advertising Sales
01322 221144

Sales Director
Luke Webster
lwebster@findlay.co.uk

Deputy Sales Manager
Simon Bonell
sbonell@findlay.co.uk

Account Manager
James Slade
jslade@findlay.co.uk

Production Manager
Heather Upton
hupton@findlay.co.uk

Circulation Manager
Chris Jones
cjones@findlay.co.uk

Publisher
Ed Tranter
etranter@findlay.co.uk

SSN-0261-2097 (Print)
ISSN 2049-2324 (Online)

Eureka (incorporating Engineering Materials and Design and Design News) is free to individuals who fulfil the publisher's criteria. Annual subscriptions are £81 UK (£118 overseas or £153 airmail).

If you change jobs or your company moves to a new location, please contact circulation@findlay.co.uk to continue receiving your free copy of Eureka.

Origination
CC Media Group
Printed in UK by
Pensord Press Ltd

©2013 Findlay Media Ltd

Published by
Findlay Media, Hawley Mill, Hawley Road,
Dartford, Kent, DA2 7TJ
Tel: 01322 221144
www.eurekamagazine.co.uk

Findlay Media is a
member of the
Periodical
Publishers'
Association



Science Minister opens new Bloodhound headquarters

David Willetts, Minister for Universities and Science has opened the new BLOODHOUND Technical Centre in Avonmouth, Bristol, where the iconic 1,000 mph jet and rocket powered racing car is now being assembled.

As recognition of the Project's success in inspiring children towards science, technology, engineering and mathematics (STEM), Willetts announced a £1m grant for Bloodhound to support its education and outreach mission. This is funded by the Engineering and Physical Sciences Research Council (EPSRC), a founder sponsor of the Bloodhound programme. A uniquely 'open source' high technology programme, 5,340 UK schools, including primaries, secondaries and special educational needs colleges are already using Bloodhound materials in class. The funding will help the Project's education team and 500 ambassadors extend this work and inspire more children to study STEM subjects.

During his visit, Mr Willetts helped Bloodhound's engineers join the carbon composite front section, driver Andy Green's 1,000 mph 'office', to the metal rear chassis which will house the car's custom-designed rocket. This marked a major milestone for



Bloodhound, which will be the most powerful land vehicle ever created.

Universities and Science Minister David Willetts said "Bloodhound is British science and engineering at its visionary best. The project's success will not only be measured in miles per hour, but also in how it inspires future generations. This new investment will help show even more young people how rewarding science and engineering careers can be. It's been an honour to be part of the Bloodhound journey so far and I wish the team the best of luck for the world land speed

record attempt."

Professor David Delpy, EPSRC chief executive, said: "EPSRC has supported the Bloodhound Project since 2008. It's an exciting example of Science and Engineering which has already inspired young people. We want that educational work to progress beyond the actual land speed record attempt and this funding will help the team achieve even more by firing the imagination of tomorrow's

research leaders."

Richard Noble OBE, Bloodhound Project director said: "It is significant that EPSRC was one of our original sponsors, for they recognised in the early days that this was an education project with a difference. This grant is an endorsement of all the work done by our team and ambassadors since then, and it will help us work with more schools and inspire even more children as the car rolls out and we share the images and data from record breaking runs with them."

www.bloodhoundssc.com

VINCE CABLE AND MIA WELCOME MAJOR INVESTMENT IN 'MOTORSPORT VALLEY UK'

Business Secretary, Vince Cable and the Motorsport Industry Association (MIA) have welcomed the news that, from June 2014, Honda will base its European racing operation in Milton Keynes, as it prepares for its participation in Formula One (F1), with

McLaren, in 2015.

The new facility, within the new R&D centre of Mugen Euro, will be the European frontline operation for Honda's F1 participation, and World Touring Car Championship (WTCC), where it will rebuild and maintain the power units being developed at Honda R&D centre in Tochigi, Japan, and also base its trackside support operations.

Secretary of State for Business, Rt. Hon. Vince Cable said: "We very much welcome Honda's announcement, which follows hard on the heels of the launch of the automotive industrial strategy. The strategy underlines the Government's commitment to work with

world-class companies and organisations, including those in motorsport. The decision by Honda emphasises the importance of the UK's Motorsport Valley as a world renowned centre of excellence for technological innovation and product development."

Chris Aylett, CEO of the MIA added: "This is marvellous news for the UK motorsport industry, which could not have come at a more appropriate time, following so closely the launch of the UK Automotive Strategy and the announcement of plans for joint Government and industry investment of £1 billion in an Advanced Propulsion Centre by Business Secretary Vince Cable at Goodwood, last week. This decision by Honda to invest in the heartland of the UK Motorsport Valley community is extremely significant."



Engineering Design Show – Conference Programme finalised

With two months to go until the Engineering Design Show opens, the speaker programme for the Engineering Design Show Conference is complete.

Last year's Conference attracted more than 600 delegates over the two days. In common with the 2013 Engineering Design Show's brief to be bigger and better, this year's Conference Programme will surpass 2013's in terms of quantity and quality.

The Programme will include some of the biggest and most innovative names in UK engineering addressing the audience on October 2nd and 3rd. The first day, for instance, will begin with a keynote address

from **Andy Richardson** of Jaguar Land Rover on how his company is seeking to unlock more from the virtual world that it can use in the vehicle design process. Richardson will be demonstrating the benefits of virtual tools.

JLR will be far from the only world-beating UK company to feature at the show. Indeed, another highlight of day one will be an address from **Andy Bradford**, head of engineering for the world's leading small satellite company Surrey Satellite Technology Limited. He will discuss the challenges of designing for this harshest of environments.

Also on day one, **Caroline J Simcock**, head of motor design for Dyson, will talk through the technology and methodology behind some of the company's cutting edge developments, including the company's revolutionary digital motor design.

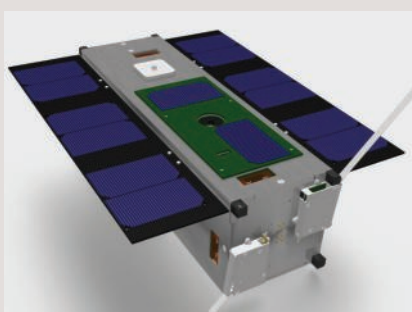
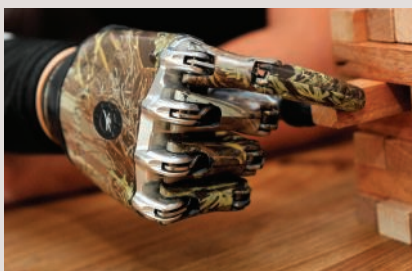
Day two will kick off with a similarly prestigious keynote to day one. This time, **Chris Dent**, Head of Research & Technology for Lockheed Martin UK will talk about the technological challenges and demands that come with a role working for one of the world's defence and aerospace giants.

The conference's only panel session will take place on day two. Entitled 'Additive Manufacturing – what's in it for me?', it will feature some of the leading experts on the processes that have come to be known popularly as '3D printing' and will advise delegates on the realities behind it.

Another UK design and engineering triumph will feature on day two in the form of RSL Steeper's **Ted Varley**, who will demonstrate the company's highly-advanced, award-winning bionic prosthetic hand, which the Leeds-based company claims to be the most sophisticated available.

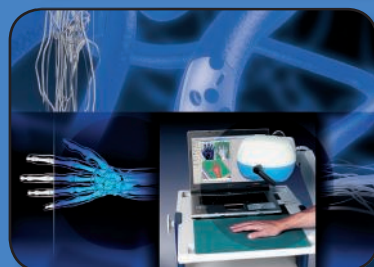
• This is just a selection of the speakers at this year's Conference. For more details, turn to page 13 or go to www.engineering-design-show.co.uk/conference/2013/ to register to attend. Design engineers will be able to book a pass for the whole conference or for individual sessions, allowing you the opportunity to plan your visit to the show to fit exactly to your requirements.

Engineering design show



Miniature Drive Specialists

FAULHABER



High reliability, quality and performance are key for applications in the field of medical device technology.

FAULHABER drive systems are proven solutions for a wide range of applications in fields such as high-tech prosthetics, portable drug delivery, micro-dosing pumps, ultrasound and surgical robotics for minimally invasive procedures.

EMS

www.ems-limited.co.uk

0118 9817391

DC Micromotors
Brushless DC motors
Gearmotors
Low Profile Motors
Stepper Motors
Drive Electronics
Linear Actuators
Custom Solutions
Piezoelectric Motors

Willetts announces funding for 'great technologies'

Universities and Science Minister David Willetts has announced £85 million in funding to provide equipment in three of the "eight great technologies" being targeted to drive growth.

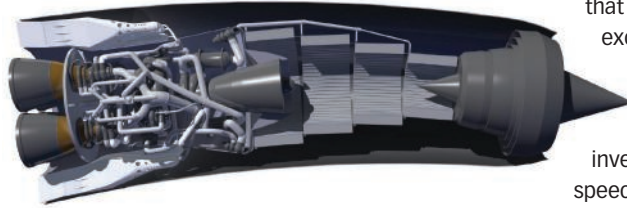
Funding through the Engineering and Physical Sciences Research Council will be made available to more than 20 universities across the UK to support research within robotics and autonomous systems, advanced materials, and grid-scale energy storage.

The Government's investments will be added to by contributions from higher education and industrial partners. The £25m EPSRC grant in robotics and autonomous systems will be complemented by £8.4 million from higher education institutions and £6 million from industrial partners.

An investment of £11.7m by universities

and £5.5m from business will complement the council's £30m grant in advanced materials, while grid-scale energy storage will receive a grant of £30 million with contributions of £9.8m from universities and £5.8m from industry.

Equipment being funded includes micro-engineering facilities at Imperial College



London for the development of miniaturised robots for surgery and targeted therapy, and a new research facility at Brunel University to deliver revolutionary manufacturing methods which allow the reuse of metal in car making.

Speaking at the Global Intelligent Systems conference in London on 17 July, the universities and science minister said that in order to get ahead "in the global race", the UK would have to back emerging technologies and ensure its universities have the latest equipment.

"This capital investment will help scientists make new discoveries and take their research through to commercial success. It will drive growth and support the government's industrial strategy," Mr Willetts said.

David Delpy, EPSRC chief executive said the successful bids would build capability in areas that were "vital for the country and where exciting research is already being carried out".

Meanwhile on 16 July, Mr Willetts also announced a £200 million investment in the UK space industry. In his speech, he reiterated the UK's target to capturing 10% of the growing world market in space. In the three years since the creation of the UK Space Agency the UK had "rediscovered our pride in our great space history and recognised that we can have pride too in our future".

3D printers may be harmful at home

3D printers may be harmful to humans if they are not set up in the right environment, researchers at the Illinois Institute of Technology have warned.

Many of the 3D printers on the market today rely on a process called "heated thermoplastic extrusion and deposition", which emits ultrafine particles (UFPs) into the air. These particles are less than 100nm in diameter.

In an industrial environment, these particles would normally be removed by a ventilation system, but commercially available printers are currently sold as standalone devices without any exhaust ventilation or filtration accessories.

If these particles are inhaled they can build up in the lungs or be absorbed directly into the bloodstream, potentially resulting in adverse health effects including cardio-respiratory mortality, hospital admissions for stroke, and asthma symptoms.

"These results suggest caution should be used when operating some commercially

available 3D printers in unvented or inadequately filtered indoor environments," lead author Brent Stephens from the Illinois Institute of Technology stated in his report.

"Additionally, more controlled experiments should be conducted to more fundamentally evaluate aerosol emissions from a wider range of desktop 3D printers and feedstocks."

The team at the Illinois Institute of Technology tested two different 3D printing materials – acrylonitrile butadiene styrene (ABS) and polylactic acid (PLA) – to see how many UFPs each one emitted.

Both materials were found to increase the concentration of UFPs in the air, but ABS emitted 10 times as many UFPs as PLA. The researchers claim that a single ABS-based 3D printer has an emission rate similar to that reported during grilling food on gas or electric stoves at low power.

ABS and PLA are both used by the £700 Velleman K8200, launched earlier this month by Maplin, which is the first 3D printer to be sold on the high street.

3D printed cast the future



Jake Evill, a media design graduate of the Victoria University of Wellington in New Zealand, has created a 3D printed cast for fractured bones that he says could replace the bulky, itchy and smelly plaster or fibreglass ones.

The prototype Cortex cast is lightweight, fully-ventilated, shower friendly and thin enough to fit under a shirt sleeve.

It utilises the X-ray and 3D scan of a patient with a fracture and generates a 3D model in relation to the point of fracture. The structure can then be fit directly to the patient off of the 3D printer, with built-in fasteners added for the final enclosure.



Craig Hudson
Elite Applications Engineer

"Following a bespoke training course, the level of support received from Craig for a business-critical issue was excellent. He even worked with us from a design perspective to help us resolve the issue, far exceeding our expectations."

**Mark Wetherick, Drawing Office
Manager, Pascall Electronics.**

**"WE RESOLVE
SOLIDWORKS
ISSUES FAST –
USUALLY IN
ONE DIRECT
LINE CALL TO
OUR TEAM."**

No other reseller matches
our technical support team for
headcount or capability.

 **SOLIDSOLUTIONS**

For leading 3D CAD design software, and all-round user support – we're Solid.
Find out more on 01926 333777

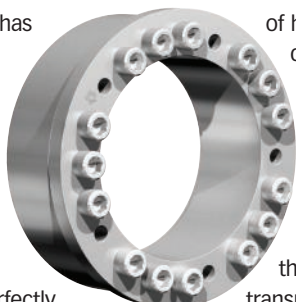
www.solidsolutions.co.uk/support  **SOLIDWORKS** reseller of the year 2004 – 2011

Got a story? Then drop us a line at eurekanews@findlay.co.uk or call us on 01322 221144

Torque transmission in challenging environments

Ringfeder Power Transmission has expanded its portfolio of shaft-hub connections with five innovative products added to its portfolio.

The range of locking assemblies now comprises four models which cover a wide spectrum of possible applications. Its slim design perfectly qualifies the locking assembly 'RfN 7012 stainless steel' to be used for the transmission



of high torques and axial forces in confined spaces. It compensates small tolerance deviations and minor mounting errors. Installation and de-installation are extremely easy, since fitting is not necessary and the device self-releasing.

The new range is rounded off by the shrink disc 'RfN 4061' which transmits torques from 30 to 100,000Nm, depending on the device's dimensions
www.ringfeder.com

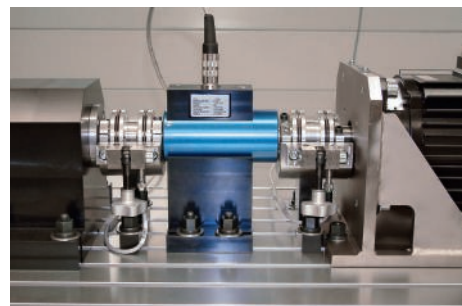
Mini short-range sensor

Sick's new OD Mini short-range distance sensor is one of the world's most lightweight and precise displacement sensors incorporating an easy-to-use display and control.

The OD Mini achieves micron resolution and millisecond responsiveness in a rugged, compact and lightweight unit making it ideal for precision measurement and positioning applications where high levels of accuracy are demanded, especially at high speeds, for example for positioning of robotic gripper arms.

The OD Mini's high performance measurement capability also means it can be used for quality duties such as inspection of manufacturing tolerances, as well as sorting and classification.

www.sick.co.uk



High-speed torque testing sensor

Kistler designed the Type 4503A torque sensor to provide a flexible instrument for use at rotational speeds of up to 50,000 rpm with a choice of fourteen measuring ranges from 0.2 to 5,000 Nm.

Additional benefits are two, switchable ranges, with the second range being either 1:10 or 1:5 of the rated torque, integral digital signal conditioning providing both analogue and digital outputs, contactless signal and power transmission and a speed sensor output of up to 360 pulses per revolution.

The option of two switchable ranges allows precise measurement of both peak and operating torque with the same sensor. In applications with a high peak, but moderate operating torque, a sensor with only one measuring range would have to be selected to withstand the peak torque which would compromise measurement accuracy at the lower operating torque.

www.kistler.com

Pressure sensor range expands

Variohm EuroSensor has expanded its range of pressure sensors with the new EPT1400 series for gas and liquid gauge pressure ranges to 250 bar. The miniature 304 grade stainless steel sensor is based on an M8

port configuration in a 14 mm diameter, SW14 body with a nominal length of 32 mm.

The EPT1400's design features a hermetically-welded, thin film measuring cell coupled with high-level output circuitry that yields a response time of <1ms with an accuracy of $\pm 0.8\%$ and long term stability of $\pm 0.1\%$. Built for use in harsh environments, including automotive, heavy industrial, HVAC, off-road construction and

agricultural applications, the sensor is sealed to IP67 and has a generous shock and vibration rating as well as an operational temperature range from -40°C to $+125^{\circ}\text{C}$. The impressive specification also includes an overrange pressure of up to 4x rated and burst pressure rating to 6x. With a working life in excess of 10 million cycles and a sensing element that contains no silicon and no internal O-rings, safe and reliable operation is ensured.

www.variohm.com



DAVALL

Driven By Quality



Tel: +44 (0) 1707 28 31 00

Stock Products



Spur | Helical | Bevels | Splines | Spiradrive
Racks & Toothed Pulleys | Gearboxes | Couplings
Worms & Wheels | Timing Belts

**Standard parts or modified
to your requirements**

Approved Distributor for:

SDP/SI | HYDRO.MEC | POGGI | GATES | CGI | FRANCIA

Contact us now with your enquiry or for your free catalogue

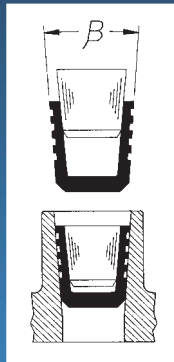
www.davall.co.uk

Plug As-Cast Holes As-Is



- *Installs into tapered as-cast holes*
- *No machining required*
- *Ideal for fragile castings*
- *One-piece design installs easily*
- *Seals to 7,000 psi*

Simply drop the Betaplug into the as-cast hole and drive in the tapered pin. That's all you do. The Betaplug body expands to form a permanent, leak-tight seal- without drilling, reaming, tapping or applying sealants. Your total installed cost is significantly lower than with threaded plugs or other expansion type plugs.



Innovation in Miniature



SEND FOR OUR FREE PRODUCT CATALOGUE

Tel: 01753 886664 Fax: 01753 889588

www.leeproducts.co.uk e-mail: sales@leeproducts.co.uk

Lee Products Limited, 3 High Street, Chalfont St Peter, Bucks. SL9 9QE.



Miniature linear guides! From 5 mm diameter, 9 mm rail width, 6.5 mm height. Polymer sliding components eliminate lubrication and maintenance. Flat and lightweight e.g. DryLin® N ... especially strong DryLin® T ... for round shafts, quick and quiet DryLin® R ... optimised load distribution, flexible DryLin® W. All ex stock, no minimum order.

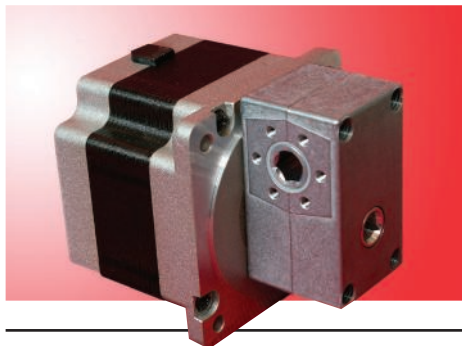
igus®.co.uk/mini
Complete range online! plastics for longer life®

igus® (UK) Limited

51A Caswell Road
Brackmills Ind. Estate
Northampton NN4 7PW

Phone 01604-677240
Fax 01604-677245
sales_uk@igus.co.uk

Stepper worm gearbox drives added to Astrosyn motor range



Designed to provide ultra-high torque in a compact package, the new worm gearbox drives from Astrosyn International Technology produce high output torques of up to 17 Nm.

The rugged gearboxes are made of die-cast zinc and incorporate case hardened steel gears with synthetic friction bearings. When fitted to NEMA size 23 or 34 hybrid stepper motors the combined powertrain generates high holding torque through a thin-profile

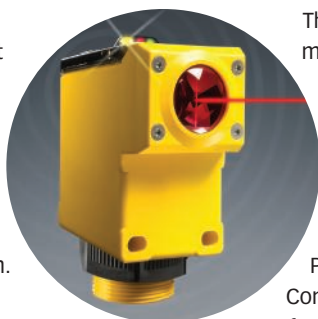
worm gearbox. The unit provides a compact low-cost solution for widespread applications in medical technology, machine drives and office automation with critical weight, space and volume constraints.

Worm gearbox input and output can be modified to customer requirements, with gear ratios from 1:1 to 30:1. A self-locking capability is also incorporated into the gearboxes.

www.astrosyn.com

Self-contained photoelectric sensor

Banner has introduced the SureCross Q45, the world's first self-contained, wireless standard photoelectric sensor solution designed for control and monitoring applications. Without the large scale requirements, complexities of cables, conduits and installation. Operators can now quickly integrate a scalable, wireless sensor network to improve efficiency by monitoring and coordinating multiple machines and processes.



The SureCross Q45 is ideal for many applications, including cable replacement, moving applications, remote applications and productivity solutions. To meet diverse application requirements, models are available in Polarised Retro reflective, Convergent Visible, Remote Device

Interface and Fibre Optic. Complete with IP67/NEMA 6P protection against liquids and debris common to industrial environments. www.turckbanner.com



Flowmeters monitor viscous flows

High-precision Oval Gear (OG) flowmeters from Titan Enterprises can monitor a viscous fluid flow at flow rates up to 500l/min, using stainless steel, PEEK or other body materials at up to 150°C and up to 700 bar.

Beneficially, unlike other flowmeters, measurement accuracy of OG flowmeters improves as the liquid viscosity increases, from a nominal one per cent to around 0.1 per cent of flow rate at higher viscosities.

In a Titan OG flowmeter, oval-shaped gear-toothed rotors rotate within a chamber of specified geometry. As these rotors turn, they sweep out and trap a very precise volume of fluid between the outer oval shape of the gears and the inner chamber walls with none of the fluid actually passing through the gear teeth. Magnets are embedded in the rotors that actuate a reed switch or provide a pulse output via a Hall Effect sensor. Each pulse or switch closure then represents a precise increment of liquid volume that passes through the meter.

www.flowmeters.co.uk

Solution to last month's Coffee Time Challenge

SPONSORED BY **MICRO EPSILON**



The solution to July's Coffee Time Challenge of how to increase safety for cyclists comes in the form of Xfire's Bike Lane Safety Light, which is designed to address that problem by using lasers to project a virtual bike lane on the road around the bike.



The Bike Lane Safety Lights are visible under headlights and streetlights

Powered by two AAA batteries, the device uses dual 5-milliwatt red lasers to project two lines onto the asphalt, extending back from either side of the bike. While those lines don't do anything to physically protect the cyclist, they do provide motorists with an attention-getting visual guide as to how much distance they should be keeping. The device also serves as a standard tail light, incorporating five 'extremely bright' red LEDs.

“To have a great idea,
have a lot of them.”

Thomas Edison

Make more of
your ideas at...

Engineering design show

- Inspiring keynotes from design leaders
- See the latest innovations from 200 exhibitors
- Enhance your knowledge through practical workshops

3 Events • 2 Days • 1 Free ticket

2-3 October 2013 • Jaguar Exhibition Hall • Ricoh Arena • Coventry

Register now for regular updates @ www.engineeringdesignshow.co.uk

Headline sponsors

HEIDENHAIN
The measure of excellence



Co-located with

electronics
design show

Engineering
Materials
LIVE!

Learn from the experts at the

FOCUSED CONFERENCE SESSIONS BY

Developments in virtual design

Andy Richardson, Head of Simulation, Jaguar Land Rover

In the future, design could be done entirely within interactive virtual environments that mirror the real world. In this session, Andy Richardson of Jaguar Land Rover will present on how his company is seeking to unlock more from the virtual world that it can use in the vehicle design process.



The five principles of product development

Simon Smith, Associate Director - Products & Systems, Cambridge Consultants

Getting a product to market is hard, creating a successful product is harder. By storyboarding a consumer's journey, Cambridge Consultants will illustrate and discuss the five rules of innovation which make the difference to a successful product.



Reinventing the wheelchair

Michael Phillips, Design Development Director, Renfrew Group International

A broad brief and a lot of creative design have laid the foundations for a complete overhaul of the wheelchair that may offer huge benefits. In this session, Michael Phillips of Renfrew will explain how his company overcame the many challenges faced when modernising something that hasn't changed much in many years which resulted in the 'Chair for Life'.

The Dyson Way

Dr Caroline J Simcock, Global Compliance and Approvals Manager, Dyson

Dyson is synonymous with outstanding British design; the company prides itself on engineering products which work in different and better ways than their predecessors. James Dyson is best known as the inventor of the Dual Cyclone bag-less vacuum cleaner, based on the principle of cyclonic separation. He is a design icon in his own right, championing engineering and inspiring young minds.

Brompton Bicycles: Riding high

Will Carleysmith, Head of Design, Brompton Bicycles

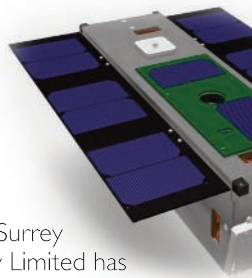
The factor that distinguishes between good and great products is great design. The Brompton folding bicycle is a classic example of this. Brompton Bicycles has achieved a level of prominence and success in its market that is based around a design that puts it a cut above its competitors. In this session, Will Carleysmith, who has been intimately involved with the design of Brompton bikes since 2004, discusses the design philosophy behind this British engineering success story.



Designing for space

Andy Bradford, Director of Engineering, Surrey Satellite Technology

Having begun life as a spin-out from Surrey University, Surrey Satellite Technology Limited has become one of the foremost reasons for the UK's success in space technology. In this session, SSTL's Andy Bradford will talk delegates through the



Headline sponsors

HEIDENHAIN
The measure of excellence

SCHAEFFLER
LUK **TINA** **FAG**



electronics
design show

Engineering
Materials
LIVE!

Workshop sponsors

ALRAD
IMAGING

AUCOTEC

BARDEN
Aerospace and Super Precision

EMS
EMS-GRIVORY

GABRIEL-CHENIE
GROUP

GRANTA
MATERIAL INTELLIGENCE

Materialise
innovate you can count on

man machine

maxon
maxon motor uk ltd

SCOTT BADER

NYLACAST
ENGINEERING PLASTIC SOLUTIONS

Fastenings

D YOUNG & CO
INTELLECTUAL
PROPERTY

Engineering Design Show

THE LEADERS IN DESIGN ENGINEERING

challenges of designing these sophisticated systems to operate in the harshest environment of all.

Defence and Aerospace

keynote by Lockheed Martin

Chris Dent, Head of Research & Technology, Lockheed Martin

Lockheed Martin UK, part of Lockheed Martin Corporation, is a leader in systems integration, working on major programmes spanning the aerospace, defence and civil sectors. Dr Chris Dent will give an insight into the Lockheed Martin UK's latest activities.

Design technology transfer

Simon Benfield, Chairman IED/Ramboll

Simon Benfield will be representing the Institution of Engineering Designers as he takes over the role of Chairman. He will present on how systems and concepts used in his work on large civil engineering projects can transfer to the product design space.

Additive Manufacturing: What's In It For Me?

Chaired by the Eureka editorial team

Additive manufacturing; 3D printing; Rapid Prototyping – whatever you call it, it's probably the hottest technology in engineering design right now. But what does this technology really mean for design engineers? Is it really going to transform their working life? How can it aid you in your job right now and how will it do so in the future? When does it have real value and when is it simply the wrong tool for the job?



This session will bring together a panel comprising some of the leading exponents of additive manufacturing in the UK to answer these questions and many more.

Motorsport keynote

Chris Aylett, CEO, Motorsport Industry Association

How the UK's motorsport industry can play its part in 'Driving success: UK automotive strategy for growth and sustainability' and the business opportunities it presents.



Advances in robotic prosthetics

Ted Varley, Director of Development & Operations, RSL Steeper

RSL Steeper is a British company at the forefront of development when it comes to robotic prosthetic hands and the technologies that underpin these life-changing devices. This session will outline how this technology has led to the latest bebionic3 prosthetic hand, for example, which can allow the wearer to operate 14 grip patterns and hand positions.

Solar-powered racing

Cambridge University Eco Racing

This October, Cambridge University Eco Racing (CUER) will take part in the World Solar Challenge, a gruelling 3,000km marathon across the heart of Australia. Some of the members of CUER's 60-strong team will discuss the innovative design behind a car that rewrites the rulebook for solar vehicles.



Engineering design show

2 & 3 October • Jaguar Exhibitor Hall • Ricoh Arena • Coventry

BOOK
NOW &
SAVE
£95*

For full conference programme details and to book your FREE places
go to: **www.engineeringdesignshow.co.uk**

*Book before 31 August for your FREE conference places (normal price, £95 per session).

Run for the *sun*

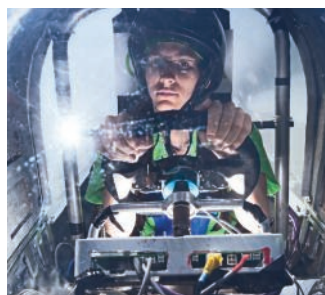
To say that the question of how the world is to meet its transport needs over the coming decades and centuries is a vexed one would be to understate the case disastrously. Climate change, emissions, dwindling fossil fuel supplies, environmental damage: all of these factors are forcing rapid change and serious investment from the automotive industry. But research in this area is not limited to And, naturally enough, tomorrow's generation of engineers is already seeking the solutions to the big questions.

It should come as no surprise to learn that Britain's leading universities are at the forefront of research in this area. Cambridge University, in fact, will soon take part in high-profile endurance competitions involving low- (or even zero-) carbon technologies that point the way to the vehicles of the future.

Cambridge University Eco Racing (CUER) is a 60-strong student organisation that designs, builds and races solar powered vehicles. Its racing cars showcase cutting-edge sustainable engineering and demonstrate the incredible potential of electric vehicle technologies.

This October, CUER will take part in the World Solar Challenge, a gruelling 3,000 km marathon across the heart of Australia from Darwin to Adelaide, starting in October 2013. The car – named Resolution – is designed to use the power of the sun to take it and its drivers through one of the world's harshest environments.

Every element of the ultra-light vehicle has been designed with the single objective of improving its race time. Resolution's innovative



design reflects the team's knowledge of automotive engineering and aerodynamics, as well as sophisticated modelling, space-grade composites and optimised solar cells. The result is a vehicle that rewrites the rulebook for solar vehicles but still meets the race parameters.

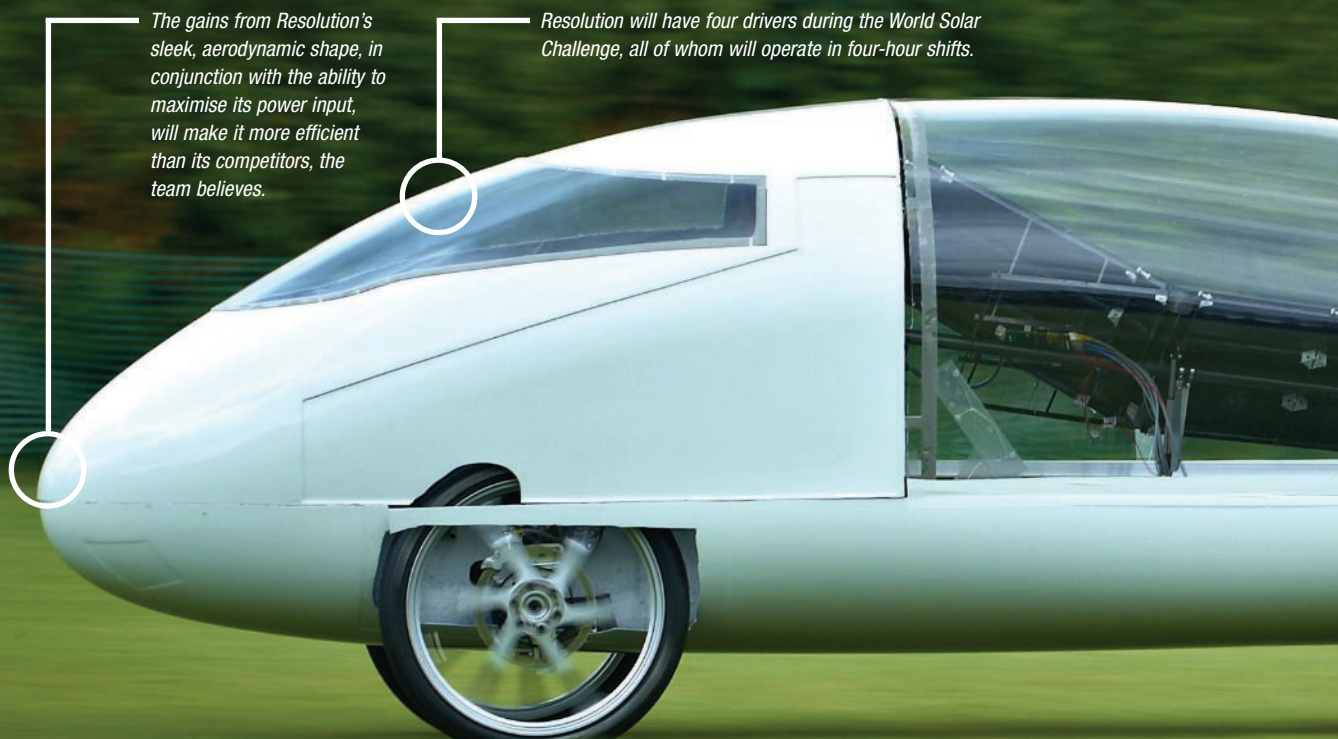
One instance of this is that, while suspension in a car usually involves a spring and a dash pot, Resolution has an in-built, carbon-based suspension system, ensuring even less energy is wasted. Locating the motor in the hub of the wheel means there is no need for gears, chains or differentials – each of which would account for a 5% loss in efficiency.

Perhaps Resolution's most radical aspect, however, is the way in which it uses a set of moving solar panels to maximise power input as they move to track the sun's position. This, it is hoped, will give the team a real advantage over bigger teams entering the competition. The race crosses 22° of latitude, so it has been necessary to create a modelling programme that will adjust the solar cells to maintain the optimum position at all times.

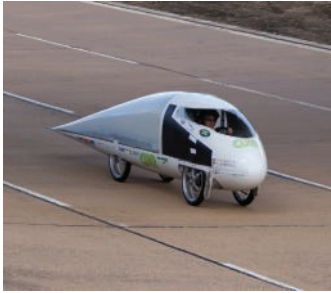
Keno Mario-Ghae, team manager for Cambridge University Eco-Racing, based at the University's Department of Engineering, said:

The gains from Resolution's sleek, aerodynamic shape, in conjunction with the ability to maximise its power input, will make it more efficient than its competitors, the team believes.

Resolution will have four drivers during the World Solar Challenge, all of whom will operate in four-hour shifts.



The solar-powered car may seem like a pipe dream, but for a team from Cambridge University, it is very much a reality. Paul Fanning reports.



"Resolution is different because she overcomes one of the main limitations that affect most solar cars.

"Traditionally, the entire structure of a solar car has been based on a trade-off between aerodynamics and solar performance. That's how they've been designed for the past 10

years, and that's why they all tend to look the same. We turned the concept on its head. Our reasoning is that solar performance needs to adapt to the movement of the sun, but the car needs a fixed shape to be at its most aerodynamic. To make the car as fast and powerful as possible, we needed to find a way to separate the two ideas rather than find a compromise between them."

The solution the team eventually hit upon involved embedding the solar panels within an aft-facing tracking plate. This plate extends from the back of the headrest to the tail of the vehicle and is pre-programmed to follow the sun's trajectory. It uses linear actuators to move the panels in such a way to ensure that they are optimally positioned at all times. The team estimates that this will give the car 20% more power than it would otherwise have had.

This structure is placed under a canopy that forms part of the



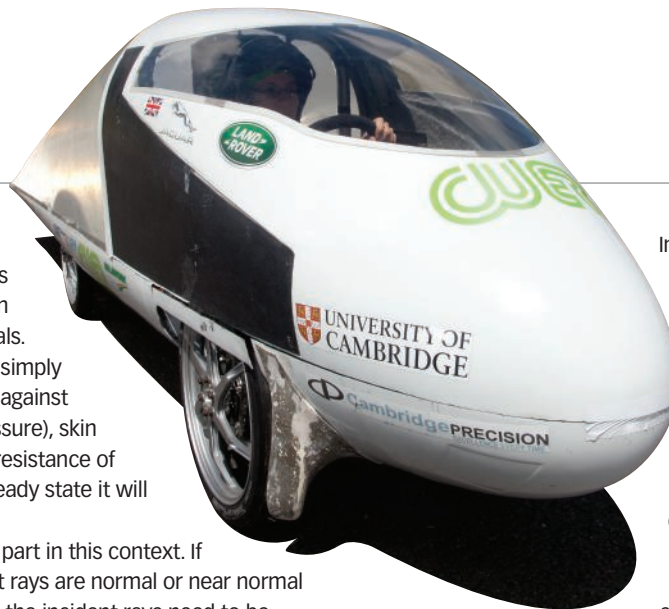
teardrop shape of the vehicle as a whole. The design is a departure from the 'tabletop' look of most other solar cars, but is more aerodynamic. Because it encases the solar panels rather than making them part of the shape, the question of power generation does not compromise the car's aerodynamics.

One factor in maximising power was the choice of Gallium-Arsenide solar cells over the cheaper silicon versions. Gallium Arsenide has the distinct advantage of much greater efficiency than silicon (particularly in high-light environments). Indeed, Gallium Arsenide is approximately twice as effective as silicon in converting incident solar radiation to light, with a theoretical conversion rate of up to 40% and has for that reason been used in solar cells in spacecraft. This choice has allowed the team to adopt a sleeker, more aerodynamic design (as opposed to the flatter, tabletop design).

The World Solar Challenge has restrictions on how much solar area is permitted – depending on the type of solar cell. If silicon were used (which is 22% efficient), the team would be allowed 6m² of cells. If space grade Gallium Arsenide cells are used, however (which are 35%-40% efficient), the allowable array area is 3m². This means the power ratio of

Placing the 3m² Gallium Arsenide Triple Junction solar cells under a canopy allows them to be tilted towards the sun. The potential 20% gain in power from tracking the sun more than makes up for the 5% losses from the sleek canopy design. This design decision has allowed the aerodynamics team to optimise the aerodynamic shape, rather than worry about pointing surfaces towards the sun.

The solar panels are embedded within an aft-facing tracking plate, which extends from the back of the headrest to the tail of the vehicle and is pre-programmed to follow the sun's trajectory and uses linear actuators to move the panels



the car compared to its competitors simplifies to a ratio of 4:5. So, in terms of potential to draw power, Resolution can draw 20% less power than its rivals.

However, once cruising, the car is simply using the energy taken in to do work against losses such as form drag (due to pressure), skin friction (due to viscosity), and rolling resistance of tyres. If the car is more efficient at steady state it will need less power to run.

The tracking plate also plays a big part in this context. If the plates follow the sun, the incident rays are normal or near normal to the solar cells. To maximise power, the incident rays need to be striking the plate at exactly 90° to the surface. It is then possible to calculate incident power based on how far from this ideal the incident rays deviate by taking the cosine of the angle between the rays and the normal. Over a day, the ability to align the solar cells as close as possible to the ideal configuration can yield gains of 15-20% over an equivalent flat array.

Rigorous test simulations showed that a narrow car (0.8m wide) using 3m² Gallium Arsenide Triple Junction solar cells would theoretically win. Placing the cells under a canopy allows them to be tilted towards the sun. The potential 20% gain in power from tracking the sun more than makes up for the 5% losses from the sleek canopy design. This design decision has allowed the aerodynamics team to optimise the shape rather than worry about pointing surfaces towards the sun.

Says Mario-Ghae: "We have a combination of an extremely small frontal area, which reduces our losses, and a more efficient array, which increases our input... Efficiency is where our real strength lies and this is how we plan to compete with the bigger teams."

For the CUER development team to achieve the best of both worlds when it comes to efficiency, it is clearly necessary to keep the weight of the vehicle to an absolute minimum. The car is intended to weigh 120kg. And while at the time of writing it came in at a slightly corpulent 128kg, Marie-Ghae is confident this can be rectified, saying:

"Opportunities to shave weight off do exist. Every change you make to the car involves finding the balance between capability and efficiency."

Tom Grimble, who was technical director for the team's 2011 race, continues the theme, saying: "The most important factor from our point of view is maximising power, but the second most important is to reduce power resistance, so it's a constant balancing act."

In any race, of course, speed is of the essence. For CUER, however, this is once again a question of balance to achieve optimum performance rather than simply hitting top speed and staying there. Says Mario-Ghae: "In theory, the top speed is 140km/hour [almost 87 mph] and we've done 110km/h, but the point is to find the speed where we're travelling as fast as possible while using the car's design and resources as efficiently as possible."

This process is achieved by maximising efficiency at every level, which includes the driver's size and weight. Resolution measures less than 5m in length, is 0.8m wide and about 1.1m in height. Driving her across the Australian desert is likely to be a claustrophobic experience.

In fact, the driver must be a maximum of 5' 3" tall. These, however, are deliberate concessions made by the team for the sake of making the vehicle as fast and efficient as possible in the hope of winning the race. In the future, more conventional solar vehicles may well adopt similar ideas, but opt for comfort, rather than speed.

Lucy Fielding is one of the four drivers who will operate in four-hour shifts and claims that, while not exactly luxurious, the car is not quite as uncomfortable as might be thought. Of course, in the Australian desert, one of the major concerns is the heat as the driver sits inside a plastic canopy in relatively cramped conditions. Clearly air conditioning was not an option given the weight and battery drain. However, says Fielding: "There are holes through which air can get in and the airflow does keep things reasonably cool."

The car is fitted with on-board telemetry, an 'intelligent cruise control' that takes into account traffic, weather and driving style, and will advise the team on how to optimise the vehicle's efficiency during the race itself. However, one area where the car is lacking is in onboard toilet facilities. According to Fielding, there are moves afoot to address what she delicately describes as "a fascinating engineering challenge", but as yet, the World Solar Challenge remains an endurance event in more senses than one.

www.cuer.co.uk

On show in October

The CUER team will be appearing at the Engineering Design Show at the Ricoh Arena, Coventry, on the 2nd and 3rd October this year.

**Engineering
design show**

CUER, which is sponsored by Altium and its UK supplier Premier EDA Solutions, will be on stand K86 (showing 'Endeavour', the previous vehicle used in the Solar Challenge) in the Electronics Design Show. The team will also give a presentation in the Engineering Design Show Conference at 12pm on the 3rd October.

To register to attend these events, go to
www.engineeringdesignshow.co.uk

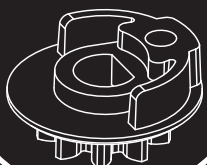


Real parts. Really fast.

A product development team needs parts to meet its rapidly approaching deadline.

Upload
3D CAD file.

How
Many Parts?

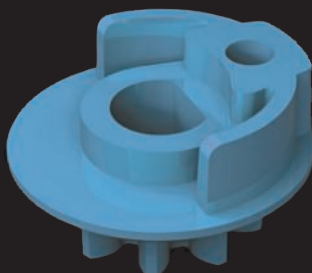


10-10,000+
parts

Receive a
ProtoQuote®
interactive
quote.

Finalise
quote and
submit P.O.

firstcut®
CNC Machining Service



From £50

protomold®
Injection Moulding Service



From £995

Receive
order
confirmation
with gate
and ejector
layout.
Approve.

Mould
design
and
milling.

1-10
parts

Receive
FirstQuote®
interactive
quote.

Finalise
options,
order.

Parts
ready
for
shipping.

Machining
begins.

Parts
ready
for
shipping.

Part
production.

It's easy to work with Proto Labs. Just upload your 3D CAD model and choose the best process for your project: CNC machining in 1-3 days or injection moulding in 1-15 days. Real parts in real materials, in days—not weeks. And that's the real story. Call +44 (0) 1952 683047 or visit www.protolabs.co.uk

Rapid Prototyping Technologies

Visit www.protolabs.co.uk/parts today to receive your FREE copy of our comprehensive comparison of rapid prototyping technologies. Enter source code EUEU13A

Check out our
video design tips!



proto labs®
Real Parts. Really Fast.™

© Proto Labs 2013 ISO 9001:2008 Certified



Track Record

After graduating from Newcastle Polytechnic, Mandy Savage secured a job within the radar division of Marconi as a graduate engineer. After a spell as project manager, Savage developed a taste for management. "I wasn't removing myself from the engineering," she says, "but was mobilising people to get it done."

It wasn't long before Savage's ability to deliver projects was noticed and an opportunity with Raytheon offered her a new challenge. Within six years, she had been appointed engineering and quality director for the business. Still not content and looking for the next big challenge, she joined Lockheed Martin UK and became engineering director in 2008. She has also been appointed as a visiting Professor for Cranfield University in association with the Royal Military College in Shrivenham.

Innovation to the fore

Synonymous with innovation, Lockheed Martin has been steadily growing its presence and capability in the UK. Justin Cunningham talks to its engineering director, Mandy Savage.

Lockheed Martin is perhaps most famous for producing aircraft that seem decades ahead of their time from its California-based research and development facility known as the Skunk Works. Perhaps less well known, however, is the company's UK presence. With more than a dozen sites dotted around the UK, its operations run far deeper than simply being a shopfront for the US.

"It is a diverse business here in the UK and I can honestly say no two days are the same," says Mandy Savage, engineering director at Lockheed Martin UK. "It's my job to ensure we get the design right for the work we do and make sure everything is ready for delivery."

Savage has a proven track record as a manager for large aerospace and defence organisations. This success saw her approached by Lockheed Martin in 2008 when the company was bidding on a massive vehicle project for the Ministry of Defence; The Warrior Capability Sustainment Programme (WCSP). It was directly competing with BAE Systems and it was make or break when she decided to take on the role.

"At the time," she says, "trying to imagine Lockheed Martin UK would dislodge BAE Systems as the Warrior design authority and be responsible for delivering it was crazy. But the business – and our investors – really held their nerve and continued to be innovative to show that we can actually do the things we set out to do."

The Warrior Capability Sustainment Programme (WCSP) was indeed a coup when in 2011 it was selected to lead the £642 million contract to extend the life of the vehicle fleet to 2040, with 90% of the work expected to be carried out in the UK. Ultimately, Savage's good judgement and hard work paid off, and she has now overseen two successful and significant vehicle bids.

The other success saw Lockheed Martin UK awarded the contract to provide the fightability – i.e. the turret and integrated gun – of the Scout SV (Specialist Vehicle), a medium-sized armoured fighting vehicle with 75% of the work expected to be carried out in the UK.

"We have got both of those projects just getting through their preliminary design review," she says. "These are really exciting products and things we have not done before and we have had to grow an engineering team and capability to deliver against those programmes in a very short period of time."

The global corporate organisation has given significant backing and support to the UK that has allowed it to grow, win business and development, with investment and projects taking place in both industry and academia.

"We would not have won Warrior had we not had that investment and expertise from the US team," says Savage. "They helped us get it set up and ultimately win it, and then they went home again – so you couldn't

ask for more than that. And if there is specific expertise somewhere that I need, I can ring my bosses in the US and access it."

Lockheed Martin UK has been a success story recently, bucking the economic trend and delivering steady growth, increased capability and attracting more homegrown talent. But it still has work to do.

"We have been recruiting for a long time and are still on the lookout for talent," says Savage. "We are trying to bring in the best systems, mechanical and electrical engineers and we still have a lot of exciting jobs and opportunities to fill."

Building upon the success in the UK, Savage seems keen to show off the talent and success of recent years. Lockheed Martin, as a whole, has a significant history in ballistic missile defence, yet in the last 18 months has decided to locate and build a payload design centre in the UK.

"We have come to a really lucrative agreement that says we are the specialists in payload design and re-entry vehicle technology," she says.

"Lockheed respects and values what the business is all about and makes sure that technology and engineering are at the forefront"

"With that comes more from the US and we are doing a lot of exciting work alongside them. That business has grown and doubled in staff in the last year and a half."

The US, particularly facilities like the Skunk Works, spends a phenomenal amount of time and money on innovation, which most UK firms can only dream of. Yet Lockheed seems keen to grow its UK talent pool, which offers the potential for some of the

technological marvels for which the brand has become renowned to have their roots in the UK.

"In the UK, most companies don't have anywhere near that ability to invest," she says. "I've worked twice now for a US company and you get those benefits of being part of a giant company in terms of funding and investment."

So, what can the rest of us learn from Lockheed Martin's ability to harness its culture of innovation? "Ultimately, it respects and values what the business is all about and makes sure that technology and engineering are at the forefront," concludes Savage. "In some organisations you might have someone in finance as Vice President, with engineering way down the line. In Lockheed, engineering is always up there on the top table as that is what we are all about."

www.lockheedmartin.co.uk

Man and Machine Training Academy



Autodesk AutoCAD courses 2014

Man and Machine also offer an extensive range of other Autodesk courses.

Man and Machine specialise in **Autodesk training** for Manufacturers, Engineers, Architects & Product Designers.

All courses are taught with the official Autodesk courseware and includes one month's free post training support.

Autodesk AutoCAD courses include:

- AutoCAD Essentials
- AutoCAD Electrical Fundamentals
- AutoCAD Advanced
- AutoCAD 3D Drawing & Modelling
- AutoCAD Mechanical Essentials

E: training@manandmachine.co.uk
W: www.manandmachine.co.uk/training **T:** 01844 263 700

Connect with us



System safety first!



RENISHAW
apply innovation™

40
years of innovation
(1975-2015)

Users of RESOLUTE true-absolute encoders are protected from crash risks and uncontrolled movement with benefits to yield, throughput and safety!

RESOLUTE encoder scale incorporates redundant data which is cross-checked by error rejecting algorithms within the readhead to confer outstanding immunity to dirt and contamination. Further data-processing continually monitors the decoded position to ensure the integrity of output data and hence safety of operation.

Download the safety white paper now: www.renishaw.com/resolutesafety

The motor way to premium efficiency

With motor efficiency regulations in place and with more to come, what can the market offer? Paul Fanning finds out.



The European Commission's energy efficiency regulations with regard to the minimum energy performance standards (MEPS) of electric motors are by now reasonably well-known throughout industry. With the IE2 standard having been introduced in June 2011 and motors for most applications being required to meet IE3 standards by January 1st, 2015 (for motors ≥ 7.5 to 375 kW), it is fair to say that the move towards higher-efficiency motors is well underway.

Having said that, there are some changes to the regulations of which not everyone may be aware. The European Commission has initiated a significant tightening of the energy-efficiency directive for electrical devices, leaving more users of drive technology facing new challenges. The exceptions of the 2009/640/EC Directive will be changed substantially as early as autumn 2013. One aspect will be particularly important for most users: the new definition of the range of very high and very low ambient temperatures in which conventional motors may be used. Up until now, IE1 motors could be used in

applications with ambient temperatures below -15°C or above 40°C . In the future, however, the exception only applies to extreme temperatures below -30°C or above 60°C .

However, as has long been argued by motor manufacturers, the legislation could not be accused of rushing anyone into adopting newer technologies. In consequence, the technology is some distance ahead of the regulations, with an abundance of super- and super-premium efficiency motors already on the market for those with the foresight (and budget) to invest in them.

Eriks, for instance, has launched the Fenner FM:3 range, a series of low-voltage cast iron motors certified for IE3 efficiency. The design includes as standard features that are optional on many competitor products.

The FM:3 range comprises 80 to 315 frame sizes and all motors are fitted with thermistors terminated in the terminal box. 180 to 315 frame sizes also include re-greaseable bearings with button-type grease nipple

and grease-through system. Spring lip seals are standard on both drive end and non-drive end, while the multi-mount design allows feet to be repositioned due to the stator and feet being fully machined prior to assembly. In addition, the motor is a symmetrical design, allowing the terminal box to be moved towards the fan cowl. Meanwhile, the generous terminal box itself offers two cable entries, making connection on site an easy job.

In parallel with the development of the cast iron FM:3 motor range, a range of aluminium IE2 efficiency motors has been developed in the shape of the Fenner FM:2 range of low-voltage electric motors. Through increased energy efficiency levels the Fenner FM:2 and FM:3 motor ranges deliver premium efficiency levels and lower TCO (Total Cost of Ownership) over the lifespan of the product.

Regal, meanwhile, offers SyMAX IHP (integral horsepower), a permanent magnet AC motor range whose radial flux design delivers high torque, ultra-high efficiency and increased power density, compared to conventional induction motors. It is a sister product to the SyMAX FHP (fractional horsepower) motor range.

SyMAX IHP meets IE4 efficiencies with 15% lower losses than the equivalent NEMA Premium motor. It is lighter than a typical induction motor and features a totally enclosed,



fan-cooled (TEFC) construction with shielded bearings and shaft seal.

Another feature is the patented Max Guard insulation system, which combines corona-resistant magnet wire and a low stress winding configuration to guarantee dependable motor life even in the most demanding applications. The motor's IP55-rated enclosure also makes it perfect for applications that require a high degree of protection against the entry of dust, water and other contaminants.

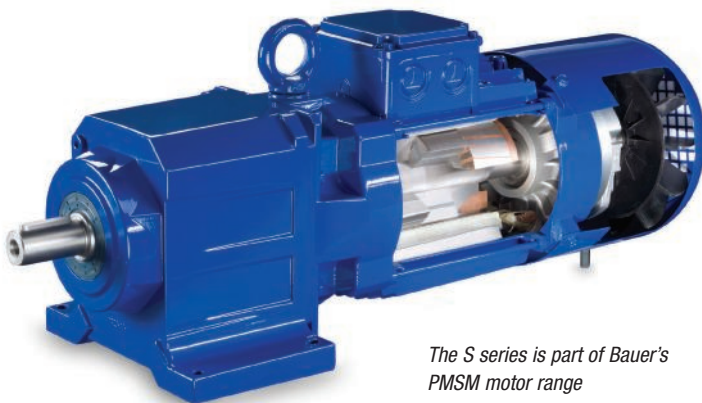
The very high torque-to-inertia ratio ensures a higher dynamic response, resulting in consistent and repeatable machine performance. In fact, its output power is such that in many cases a direct drive configuration is possible, eliminating mechanical driveline components such as gears and belts.

The rare earth magnets not only enhance power, but also allow for significant energy savings, making the SyMAX IHP motor well suited for commercial and industrial machinery, pumping and many other applications.

Bauer Gear Motor, meanwhile, has launched what it claims is the world's first Ex-rated, IE4 Super Premium Efficiency motor. Its S Series is the latest development to Bauer's PMSM (permanent magnet synchronous motor) range. An IE4 rating is the highest energy efficiency that can currently be achieved within motor technology, making the S Series the world's most efficient motor for use in explosion-hazardous areas.

The launch of the S Series means that applications that require motors to be specified and designed to meet ATEX classifications can now benefit from similar energy savings as found in other industrial areas.

Currently most Ex-e (Increased Safety) rated variable speed three-phase induction motors on



The S series is part of Bauer's PMSM motor range

Save energy online

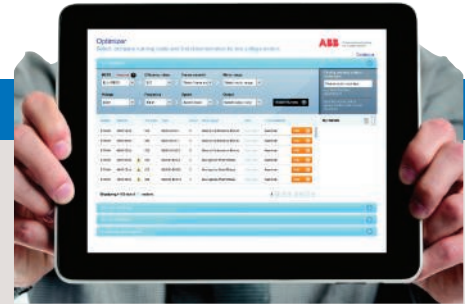
For those looking for a high-efficiency motor, ABB has launched an online tool that makes it easier than ever to select motors to meet different minimum energy performance standards (MEPS). The tool makes it easy to choose the optimum motor to meet MEPS requirements as they change or are introduced to new areas.

The Optimizer can be found at www.abb.com/motors&generators or can be downloaded from the Apple store for iPad use. Motor users can select motors, compare running costs and get further documents about their motors.

The first stage in motor selection presents the user with eight drop down selection menus. Categories are MEPS area (e.g. EU, United States), efficiency class (IE2, IE3 etc), frame material, motor range, voltage, frequency, speed and power output.

Once the required characteristics are selected, the tool presents a list of suitable motors. For instance, selecting EU MEPS, IE3, dust ignition proof motors, 400 V, 50 Hz, all poles and all outputs, returns a list of 49 suitable motors and their characteristics.

Any of the suggested motors can be easily saved with one click. The next stage is to



compare these motors to discover the cost of running them.

Motors can be compared by running cost, payback periods, lifecycle savings and reduction in greenhouse gas emission. The Optimizer will also, if possible, automatically suggest a higher-efficiency motor and highlight the additional savings that could be realised by upgrading. Test reports, drawings, data sheets and other documents can be accessed quickly and easily for the selected motors. Documents can be opened on screen, saved or exported as a zip file.

"Selecting the optimum motor to meet a specific MEPS can be a complicated task. With the Optimizer we've developed a tool that not only makes the job easy, but also provides running cost information and easy access to all the necessary documentation," says Ian Allan, general manager for ABB motors and generators in the UK.

www.abb.com

the market are generally available in standard efficiency class IE1. While the efficiency of these can be improved with the addition of frequency inverters, they still fall well short in comparison to the improved design of IE3. IE4 motors are now implemented in the IEC standard IEC 60034-30 Edition 2 draft, in addition to the newly included IE efficiency level classified for variable speed motors. The S Series offers both Ex e rating and potential energy savings of up to 40% compared to an IE2 inverter-driven squirrel cage motor.

The S series is part of Bauer's PMSM motor range which has been proven to provide the best possible energy

efficiency. The range of motors is available from 0.55kW to 15kW and are classified for Zones 1 and 21. Not only are they superior at converting electrical energy into mechanical power, they also offer the added benefit of maintaining constant speed independent of the load. This means that motor speed does not vary, despite overload variations, or cases of voltage drop, as long as the mains frequency is kept constant.

PMSM synchronous motors offer considerably improved efficiency compared to induction motors even under partial load conditions; and extremely high efficiency under rated operating conditions. They also have considerably higher power density, which, for geared motors, yields higher system efficiency with minimal installation volume – and also reduced weight.

www.eriks.co.uk

www.rotor.co.uk

www.bauergears.com

3rd - 6th September 2013

Hall 4, Stand 4A180



Extremely Heavy Duty Motors and Gearheads

- Extreme heat **200°C**
- Extreme shock absorption **100 G**
- Extreme performance
- Extreme pressure **1,700 bar**

Contact us: salesuk@maxonmotor.com

maxon motor

www.maxonmotor.co.uk

driven by precision

Making your world turn
without wasting energy.



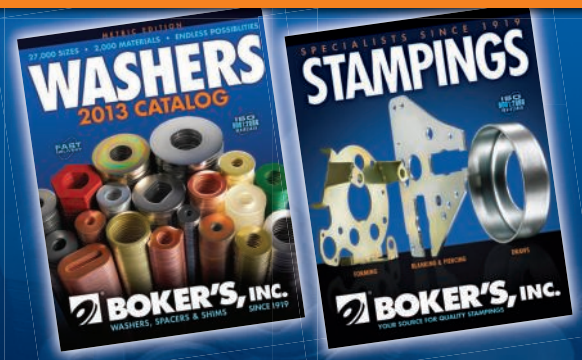
ABB has what it takes to help every industry and application reach new levels of efficiency and energy savings even under the most demanding conditions. Combining the best available materials with superior technology, ABB's range of high efficiency motors and generators are designed to operate reliably no matter how challenging the process or application, and to have low life cycle costs.

Call **07000 MOTORS** (that's **07000 668677**) or visit www.abb.co.uk/energy



WASHERS & STAMPINGS

FREE CATALOGUE & BROCHURE



Call +1-612-7299365

FAX +1-612-7298910 • sales@bokers.com

BOKER'S, INC.
STAMPING & WASHER SPECIALISTS SINCE 1919

WWW.BOKERS.COM/EUR

Power and productivity
for a better world™





Koyo®

JTEKT's Koyo brand of bearings is recognised globally as a leader in bearing design innovation and manufacturing technology.

Providing Ball, Needle and Roller Bearing Solutions to the Worlds Industrial & Automotive Markets

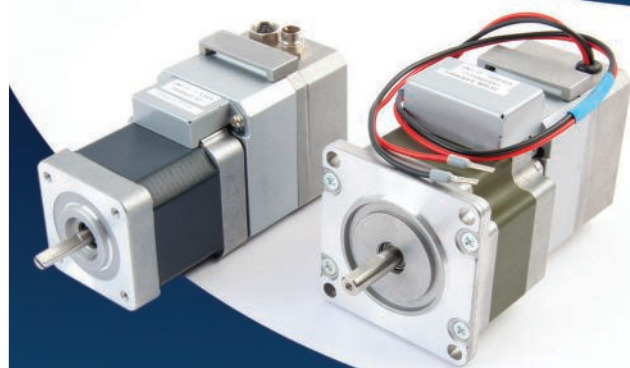


Koyo UK Ltd
Whitehall Avenue, Kingston, Milton Keynes
Buckinghamshire, MK10 0AX, UK
☎ +44 (0)1908 289311
✉ info-eu@jtekt.com

JTEKT
Koyo **TOYODA**

visit us at
www.koyo.eu

Intelligent Motion Control



Fully closed loop system
Smooth and accurate movement
Programmable Standard range from 9W to 45W

Motion simplicity with multiple fieldbus options
Modbus • PROFIBUS • CANopen • Ethernet • DeviceNet

Reliance
Precision Mechatronics

www.rpmechatronics.co.uk
Tel +44 (0) 1484 601060
sales@rpmechatronics.co.uk

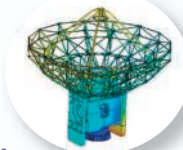
IDAC
Integrated Design & Analysis Consultants Ltd

Finite Element Analysis
Computational Fluid Dynamics
Consultancy . Software . Training

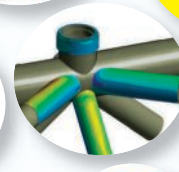
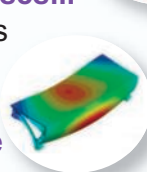
CFD
Heat Transfer
Impact

All analyses...

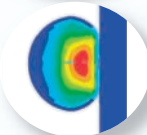
Dynamics
Fatigue
Buckling
and more



Simulation Open Days
held quarterly
visit
www.idac.co.uk/events



Oil & Gas
Mechanical
...in all industries
Biomedical
Rail
and more



ANSYS

LS DYNA

Civil FEM

nCode

Your Engineering Analysis Partner
+44 (0)844 212 5900 info@idac.co.uk www.idac.co.uk



A permanent route to efficiency

Engineers could realise significant cost and energy savings with a new compressor thanks to the introduction of an innovative permanent magnet motor. Paul Fanning reports.

An innovative, high-efficiency motor is at the heart of a new compressor that can offer energy savings of 50% over its traditional competitors.

The Interior Permanent Magnet (IPM) Motor was developed by Atlas Copco specifically for use in its new GA VSD+ compressor. This new in-house designed motor achieves an efficiency corresponding to IE 4 (Super Premium Efficiency motor class).

As well as being as much as 94.5% efficient, the Atlas Copco IPM motor is also compact and specifically customised for optimised oil cooling, meaning no air flow is required to cool it. Oil cooling also has the significant benefit that it allows the motor's bearings to be constantly lubricated, giving increased levels of uptime.

The lightweight and compact nature of the IPM motor has meant that Atlas Copco has been able to use it in reducing the overall footprint of the compressors themselves. This has been achieved by the use of a vertical drive train with the motor sitting on top.

The motor and drive train share one drive shaft and are vertically aligned to allow a smaller footprint of 55% compared to the previous range. The whole drive train is completely closed and

one oil circuit cools the motor and lubricates the element and bearings. The result is a quiet (down to 62 db(A)), reliable and compact compressor that saves space and energy while achieving higher air capacities at the same time.

The IPM motor is specifically designed to power the classic Atlas screw mechanism, with the two acting as a single mechanism. There are no belts, no gears and the two elements share the same shaft and oil circuit.

Of course, the use of permanent magnet motors has been reported as being under threat due to China's recent restriction on the supply of the crucial rare earth magnets needed to run them. However, according to Paul Clark business line manager of Atlas Copco's Industrial Air Division, this is not seen as a problem by the



company due to new suppliers having been sourced in places such as Australia and Brazil.

Oil is injected into the motor housing and runs through channels evenly around the motor, lubricating and cooling it, the bearing and the compressor element. It runs down eventually to cool the rotors.

This process is repeated constantly. If the oil becomes too hot, it goes through the oil cooler first and then runs back to the drive train.

Atlas Copco evaluated every part in this compressor: a more efficient fan, robust air intake system, eliminating all blow-off losses, and the best electronic components together with the new drive train add up to energy savings of 50% on average compared to a traditional idling compressor of the same type. The new GA VSD+ is another 15% more efficient than Atlas Copco's current Variable Speed Drive compressor (the GA 7-37 VSD). A full feature version with an integrated dryer is available as option.

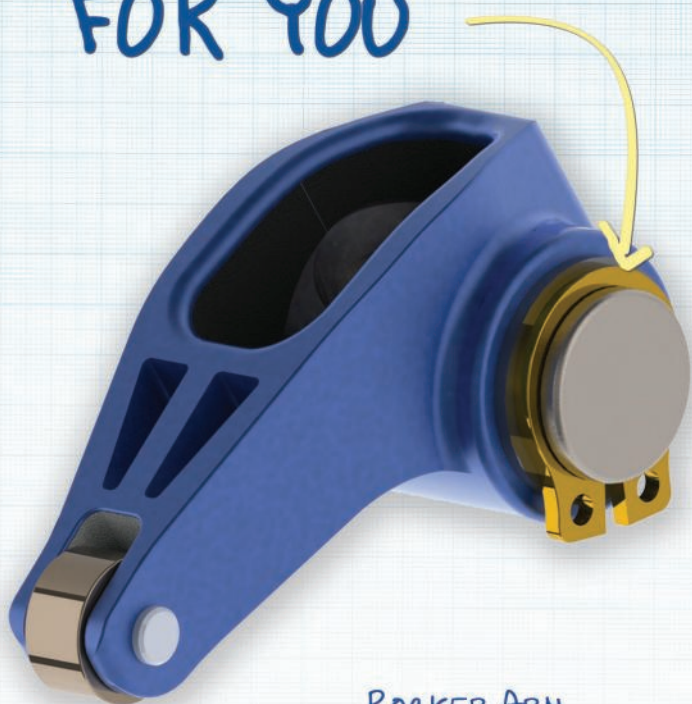
Several key components like the drive train as well as for the general design of the GA VSD+, are protected by Atlas Copco, with many patents on their way.

www.atlascopco.co.uk



Atlas Copco's IPM motor is 94.5% efficient, compact and customised for optimised oil cooling

WE ARE HERE FOR YOU



ROCKER ARM



Quality Products from the World's Leading Manufacturer
of Circlips, Spiral Rings, Wave Springs and
Hose Clamps.

WE ARE ALSO HERE FOR YOU

ROTOR CLIP

United Kingdom

U.S.A.

Germany

Czech Republic

People's Republic of China

For more information please visit
www.rotorclip.com

Rotor Clip Limited

Tel: +44 (0) 114.247.3399

Fax: +44 (0) 114.247.4499

E-mail: rcltd@rotorclip.com



Designed for Quality

HELPING YOU FIND THE MISSING PIECE

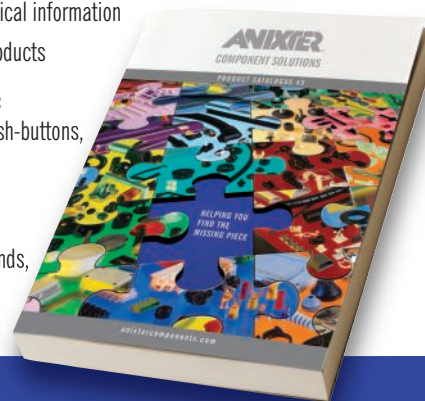
ANIXTER
COMPONENT SOLUTIONS

Product catalogue 45
now available!

- Over 300 pages
- Comprehensive technical information
- Thousands of new products

New products include:

PCB terminal blocks, push-buttons,
fuses & fuse holders,
DIN rail enclosures,
aluminium enclosures,
silicone potting compounds,
energy saving switches
and sensors.



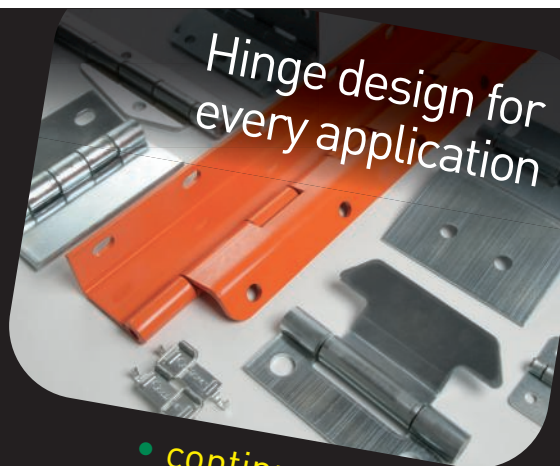
Free samples available upon request.

For your free copy call **01202 865222**

or visit **anixtercomponents.com**

Products. Technology. Services. Delivered Globally.

Hinge design for
every application



- continuous
- lift-off
- butt and backflap
- special purpose
- heavy-duty

**GOLD
and
WASSALL**

Quality hinges for over 200 years

01827 63391

www.goldwassallhinges.co.uk



Let's torque fasteners

The Phillips fastener head is perhaps the most famous in the world. So what can the company come up with next? Justin Cunningham finds out.

It is the most famous screw thread in the world. The Phillips screw drive – that's the system used to turn a screw – is known by just about everyone. Indeed, when asking for a screwdriver the follow up question by the layman is usually "Phillips or the other one?"

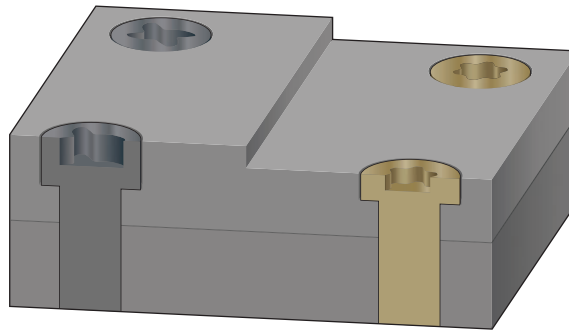
Since its introduction, of course, there have been many hundreds of weird and wonderful drive systems developed that offer numerous advantages. The originator of the Phillips drive system – The Phillips Screw Company – continues to operate throughout every sector of industry and is still innovating fastening and joining technology.

The Phillips Screw Company has brought to market a number of unique alternatives in recent years that aim to improve upon the traditional drive system. These have been aimed primarily at the aerospace industry, which always strives to save weight where it can.

The limiting factor with many fasteners – including those with the classic Phillips drive system – is the amount of torque that can be put through it. A greater torque requirement has traditionally meant either that larger fasteners have had to be used, or more of them. Either way, significant weight is added to a joint.

Calculating the necessary strength of a joint is fundamental to selecting fasteners and is the starting point for determining appropriate fastener diameter, head style and size, and the type of material to be used.

This led Phillips to develop the ACR Torq-Set Drive System. This is an offset cruciform drive



Shallower heads and more torque reduce the joint size and mass

system that allows more torque to be applied. Along with the flat walls being able to transmit more torque into the fastener, the driver will also not 'cam-out'; an inherent feature of the original Phillips drive system.

The Torq-Set is used extensively by the aerospace industry. The weight saving possible by using fewer and smaller fasteners can be



significant when looking at the entire assembly of an aircraft. And, with the drive for lightweighting perhaps more prevalent than ever, Phillips has developed another drive system to offer even more improvement.

The innovative Mortorq fastener uses four curved wings to 'provide full contact of the driver over the recess wings' that results in an unmatched ability to transmit torque into a fastener with more contact area on the drive wall.

"The Mortorq is helping the aerospace industry reduce the weight of its aircraft by allowing the use of much shallower heads on the fasteners," says Michael Mowins, president of global licensing at the Phillips Screw Company. "These are able to apply the same amount of torque, and it's that ability which is the major factor when sizing fasteners. You can see the innovative shape and this allows for a longer core to be used and ultimately results in a high-strength bolted joint that weighs less."

The design of the Mortorq also minimises the possibility of damaging the fastener, tool, or surrounding area. If the fastener drive head is damaged during tightening, the wing-like layout usually permits the fastener to be easily removed.



The Torq-Set is an obvious evolution of the original...



...this led to further improvement in the Mortorq...

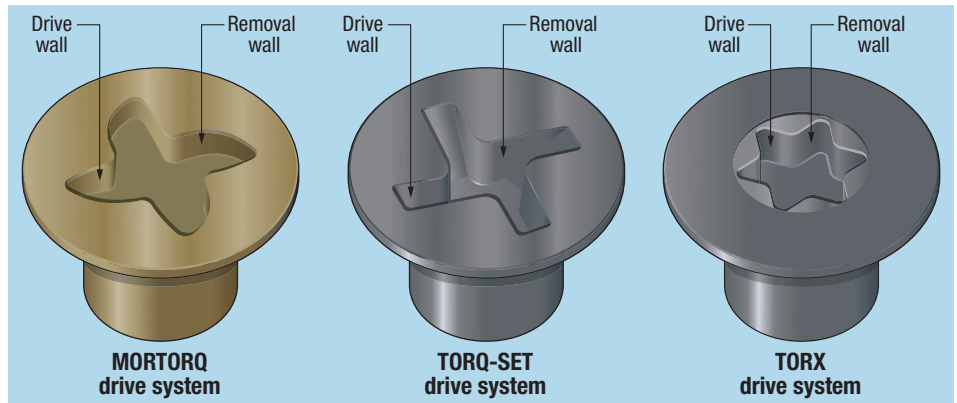


...and the Mortorq Super that enable weight saving

The rounding of conventional Phillips fasteners can frustrate at best and, if it stops the fastener getting tightened properly, can lead to failure. Its removal wall also means that it is capable of extremely high removal torque without cam-out to allow bolts – even if they are painted, thread locked or rusted in place – to be removed.

As the Mortorq is able to transfer torque so efficiently, it has meant that Phillips has been able to make the head-to-shank part of the fastener smaller. This can remove even more weight if used throughout an assembly. Compared to the spiral drive system the Mortorq has 12% less head volume, 4.4 times more surface contact and the removal wall has 7.1 times more surface contact on the removal wall.

And improvements over the popular Torx head – known for its star-like hexalobular design – are equally impressive, with the Mortorq having 13% less head volume, 8.6 times more bit contact



of the drive surface, and 13.8 times more bit surface contact on the removal wall. Taking the same head diameter as the standard Torx and Torq-Set drive head, the Mortorq can apply almost three times the torque per square inch.

This weight reduction capability has been

used by Boeing on its 787 Dreamliner, Northrop Grumman on the B-2 Bomber and Rolls-Royce on its Trent 1000 and XWB engines. As you might expect, these fasteners are made from aerospace-grade alloys.

However, for more mainstream applications with the same need for less weight, Phillips has produced the Mortorq Super. It uses the same spiral wing drive layout which permits exceptionally shallow recesses to be used.

The Mortorq Super is a stainless steel version of the aerospace grade fastener that offers many of the same advantages of high-torque capability that enables lighter weight assemblies, while taking up less space. This is particularly advantageous in tightly packed subassemblies often seen in compact electronic devices.

The drive system mainly seeks to replace standard hex socket drives and also the hexalobular socket style drive having almost 50% less head weight and over 50% less head volume in comparison. Its minimal head height also reduces the weight of fastened components, and permits strong and secure joints with less material and lower weight.

Ultimately these innovations have come at a time where there is intense interest and development around joining technologies. As multiple materials are increasingly used in single products, new joining methods are increasingly being sought.

Bonded tapes, adhesives, and snap-fit assemblies are becoming increasingly popular in many industries. However, it seems fastening companies are keen to keep bringing new ideas to the fore that offer improvement and advantage to users.

www.phillips-screw.com

Phillips – the secret to success

Born in Oregon in the US, Henry F. Phillips purchased the rights to a socket screw and redesigned the screw with a cruciform recess. The significance of the 'crosshead' or Phillips screw lies in its self-centring property.

Unlike a traditional slot screw, which requires a person to simultaneously centre the screw in its hole, steady the screwdriver in the slot and then use the screwdriver to turn the screw, the Phillips screw's cruciform head sits firmly on the screwdriver with no need to centre it.

The Phillips Screw Company is still a big part of industry 70 years on from when it was first granted a patent for its screw drive system back in 1933. In the years that followed, the Phillips drive system took off and was used throughout industry on everything from machinery to cars as it became apparent to engineers that mass production could benefit by the development of a self-centring screw that would work with power tools.

The original screw was devised to allow much easier and quicker engagement of a screwdriver with a screw over the existing traditional slotted screw. The alignment time may seem negligible but multiplied over thousands of times in a factory, the savings are palpable. Its other major selling point is the fasteners ability to 'cam-out' the screwdriver. This is its ability to roll out of the fastener once a certain torque is reached to prevent damage to the fastener.

There are many similar drive types such as the cross-recess screw drive (essentially two slots placed 90° apart) and The Frearson – also known as the Reed and Prince screw drive. Though very similar to the Phillips head, it has a more pointed 'V' shaped internal.

One advantage over the Phillips drive is that one driver or bit fits all screw sizes. The tool recess is also a perfect, sharp cross allowing for higher torque to be applied, unlike the rounded, tapered Phillips head, which was designed to 'cam-out' at high torque. It was developed by an English inventor named Frearson in the 19th century and produced from the late 1930s.





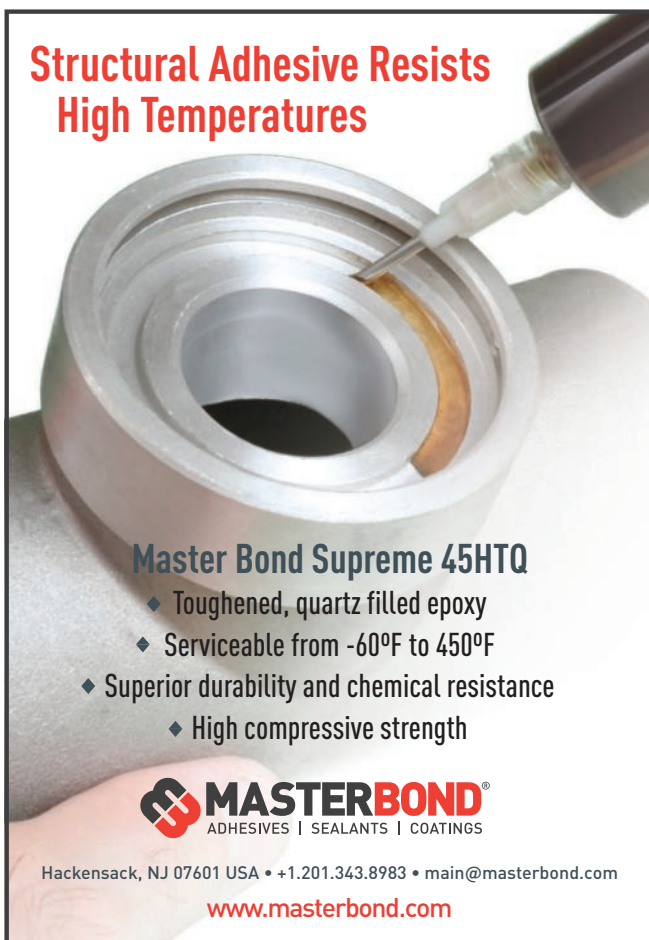
An innovative solution to a simple problem
Linear Springs offer straight line loading

- Carbon & Stainless Steel
- No Tooling Costs™
- Over 200 sizes
- Exotic Alloys Available



call now to speak to our expert team
+44 (0)1435 860333
www.linearsprings.com

Structural Adhesive Resists High Temperatures



Master Bond Supreme 45HTQ

- ◆ Toughened, quartz filled epoxy
- ◆ Serviceable from -60°F to 450°F
- ◆ Superior durability and chemical resistance
- ◆ High compressive strength



Hackensack, NJ 07601 USA • +1.201.343.8983 • main@masterbond.com

www.masterbond.com

High-tech Adhesives

Casting of switches, plugs and relays



Visit our website!
www.DELO.de/en/automotive



- Fast curing in seconds
- In-line tightness check enabled
- Resistant to soldering processes
- Outstanding processability

DELO

Leading by intelligent bonding technology

DELO Industrial Adhesives

Phone +49 8193 9900-0 • contact@delo.de
www.delo-adhesives.co.uk



BLOCAN® Profile System

- Connection Systems
- BLOCAN® Profile Systems
- Linear Components
- System Solutions

RK ROSE+KRIEGER
A Phoenix Mecano Company

6-7, Faraday Road | Aylesbury
Buckinghamshire HP19 8TX
Tel 01296 398865 | Fax 01296 398866
e-Mail: rkqb@phoenix-mecano.co.uk
www.rk-online.co.uk

- ◆ Non processing fastening system
- ◆ High load connections
- ◆ Easily modified



Moore International Ltd


Newly appointed as a key distributor for SCHNEEBERGER Linear products within the UK & Ireland

SCHNEEBERGER
LINEAR TECHNOLOGY

See us at Stand D59
Northern Manufacturing & Electronics Exhibition
2nd - 3rd October 2013
Event City, Manchester, UK

Minislides
Miniature series
Cross roller bearings
Micro Frictionless Tables
High Precision, Innovative and Reliable

www.mooreinternational.co.uk
sales@mooreinternational.co.uk
Tel: 01202 743222



DUDLEY ASSOCIATES

The UK's leading prototype mould manufacturer and volume producer for the plastics industry

Dudley Associates Limited is a centre of excellence for the design and manufacture of plastic injection mouldings on short lead times.

Toolmaking

Rapid Prototyping

Plastic Injection Moulding

Product Design and Development

Contact us:
Tel: 01455 558825
Email: info@dudleyassociates.com
www.dudleyassociates.com

Quality Standard Company
UKAS
018

Fixing the composite question

Composites present particular challenges when it comes to using fasteners. Here, Eureka looks at the way in which one company is addressing these issues.

Strong as many engineering composites are, they can be easily damaged by a fastener that would give excellent service when joining metals. A second limitation on the use of metal fasteners with advanced composites is the fact that certain metals commonly used for high-strength fasteners can experience galvanic corrosion in composites containing graphite or carbon fibres.

The advantage of composites, of course, is that the fibres can be placed in the ideal direction to carry the loads. This, combined with their inherent light weight, results in dramatic weight saving possibilities. Another benefit of using composite materials in design is that complex parts can often be made in a single moulding, reducing the need for assembly and mechanical fastening operations.

Composites, particularly high-performance composites such as those containing carbon fibres, are generally perceived to be expensive, time-consuming to make and difficult to joint. Overcoming these problems is therefore a major challenge to their more widespread acceptance. Even the aerospace industry, like automotive, is facing the challenge of rapid processing of composite parts and structures, and there is a clear demand for rapid manufacturing processes.

For these reasons, there is a requirement for composites specifically for use with composite materials. One company that specialises in this is the UK's own bighead. which has made automotive fasteners, marine fasteners, construction fasteners, panel fasteners, composite fasteners and special fasteners for over 40 years. These fasteners all share the original bigHead design: a flat perforated head which locks the product securely into position and spreads the load, is welded to a wide choice of studs, nuts, collars, pins and other fixings to offer versatility.

Critically, this design can support a huge



range of design solutions. Consequently, bigHead has made over 5,000 designs for customers – in addition to the 400 standard products supplied on a day-to-day basis.

A recent example where this fastening solution came into its own was as a specialist fastening solution to Proseat for a high-end ventilated seat module. Embedded directly in the polyurethane seat cushion, the bigHead fastener provides a very secure anchor point for a fan unit to be attached under the seat cover. The threaded stud connection allows the fan unit to be easily assembled and later removed for

repair. The bighead makes the whole construction simple and quick to install.

The design of the fasteners allows the product to be embedded in foam, rubber, plastic or composite material. Alternatively bigHead fasteners can be surface bonded with adhesive. An instance of this is seen in the carbon fibre diffusers on Aston Martins, which are attached using bigHead fasteners and bigBond adhesive. Discrete and very strong, the bigHead fasteners provide a unique solution. Surface mounted on the inside of the diffuser the bigHeads are completely invisible, with no rivets or drill holes necessary. Due to the unique design of the perforated head, the glue flows through the holes and hooks the fastener into position, achieving high stability and strength.

www.bighead.co.uk

**Additive Manufacturing
3D Printing
Prototyping
Product Development
Software
Scanning
Digitising**



**inspire.
design.
make.**

**REGISTER
NOW...**

**25-26 September 2013
NEC, BIRMINGHAM, UK
www.tctshow.com**

Designing out cost

Software that allows engineers to identify early in the design process the cost of components and suggests areas for improvement can make a big difference. Justin Cunningham reports.

So-called 'lite' simulation software tools are increasingly being used by engineers at the front end of the design process is increasingly being leveraged by engineers. Being able to recognise at the conceptual stage fundamental areas of optimisation has proved valuable.

Running FEA or CFD early on by no means provides the same sort of in-depth analysis offered by specialists later on in the process. Rather the process points engineers in the right direction, letting them know when they are heading down blind alleys.

This concept of early 'lite' analysis that can be run by more generalist design engineers was taken onboard by US-based aPriori. It wanted to provide the same sort functionality with costing elements within a design.

"There are all kinds of ramifications of not having visibility to cost early in the product development cycle," says Rick Burke, vice president for marketing at aPriori. "You are making decisions about designs, materials, and manufacture without knowing how much

anything will really cost.

"Engineers have always been exceptionally good at meeting the form, fit and function requirements of a product. And while they might have some ballpark idea of how much it might cost, you can't just design a product and throw it over the wall to manufacturing and expect them to sort out getting the costs down. You just can't do that anymore... We have found a lot of companies are increasingly looking for some type of solution to help them get early and accurate visibility to cost."

Costing is generally done after products have been designed and passed to manufacture. Products can then enter into substantial redesign and development work to reduce product costs, which can be done after products are being manufactured and sold. This is why many staggering cost reductions are possible several years after the initial product release.

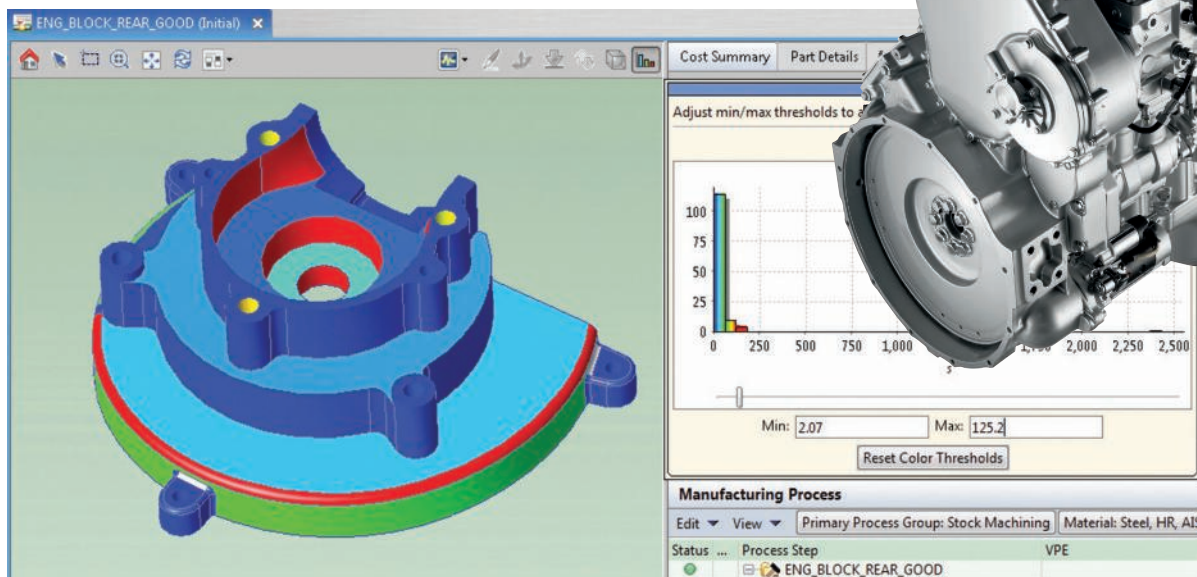
This proved a problem for US agricultural company John Deere, which

prompted collaboration with a local university to develop software that was easy to use, compatible with modern CAD packages and, above all, able to inform engineers at the conceptual stage about cost.

"The aim was to take a CAD model, extract all of its design features, figure out what each step in the manufacturing process would cost and then add them all up," says Burke. "We also needed it to be extremely fast and easy to use."

Ten years on from that initial work with John Deere and aPriori has been able to expand beyond agriculture and construction equipment, and is now used by a broad array of industries including automotive and aerospace.

The process is able to evaluate various





Showcase



Productdemo



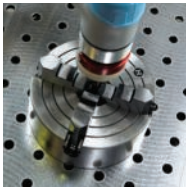
UNIVERSAL ROBOTS

Teach the robot new routines by pulling the robotic arm through desired movements.

Automate your production – safely, simply, inexpensively



Pick and Place



Precision Work

Universal Robots has reinvented industrial robotics with lightweight and flexible robot arms. Sold in more than 40 countries worldwide, the Danish-designed robots automate production in all industries – even in companies that regard automation as prohibitively expensive, cumbersome, and difficult to integrate.

Unrivalled Performance: Weighs as little as 18 kilo with payload ranging from 5–10 kilo and a reach of 1300 mm.

No shielding: The advanced safety system of the robot combined with a risk assessment makes use of the robot without shielding possible.

Repeatability: $\pm 0,1$ mm allowing quick precision handling of even microscopically small parts.

Intuitive graphical user interface makes setup and programming simple. No previous programming experience required.



195
DAYS | AVERAGE
PAYBACK
PERIOD

Locate our distributors at:
www.universal-robots.com

Universal Robots A/S
Sivlandvænget 1,
DK-5260 Odense S, Denmark
Tlf. +45 89 93 89 89



Power and productivity
for a better world™

Keep up to date with legislation, innovations, news and views.



Visit the ABB Educational Channel
www.eurekamagazine.co.uk/abb



Truck manufacturer Iveco has recently signed up as a user of aPriori

processes accurately, including sheetmetal forming, plastic injection moulding, forging, castings, machining, heat treatment, as well as factory, assembly and labour costs.

Cost avoidance

The software from aPriori can be used across organisations by designers, sourcing, purchasing and for making outsourcing decisions. However, one of its greatest assets is the information it can give to a designer early on, not least by allowing them to set up target costs for a part or assembly.

It is run in conjunction with a CAD model in real time and shows the effects new features or different materials has on the part cost. This is being dubbed 'cost avoidance' and is allowing engineers to get instant feedback on the effect what they are they designing has on the cost of a part to be manufactured and shipped.

"With aPriori on the desktop, engineers can look at more design alternatives as they can instantly tell the difference in cost," says Burke. "We find users discover designs that meet form, fit and functional requirements, but prove to be lower in cost."

This is similar to the philosophy of design for manufacture, which takes the view that designing a part for a manufacturing process will yield a lower-cost part, remove unnecessary processes and allow higher throughput. However, aPriori is quantifying this approach and showing the results in dollars and cents.

For operations such as castings, for example, aPriori has been able to highlight the areas that are most sensitive to cost using a simple heat map laid over the model. This considers both the cycle time of an individual operation as well as any post operations.

For example, if an engine block has a round along its circumference that has to be machined in, it may take 45 minutes to machine and cost £30. The software then analyses the design and shows heat map of the casting of everything that exceeds a certain cost or cycle time in red. It then grades down to orange, yellow and eventually blue for features below the target threshold.

The company has been able to make inroads to Europe over the past two years and has recently seen Iveco sign up as a user. The truck manufacturer is in the early stages of deploying aPriori and has a number of design and sourcing engineers currently using and configuring it.

"Like a PLM system, it can't just be turned on," says Burke. "It is an enterprise application and takes time to set up. And engineers have not had the capability to calculate and manage cost to a target before, so that also takes time to work in to a process."

The software works by importing the bill of materials from either a PLM or ERP system, which can then be organised in to different functional groups. Using the example of Iveco and truck manufacture, it may be powertrain, suspension, interior and so on. PLM data normally includes the part name, quantity and also an associated cost or budget, aPriori is then able to cost new designs that can be compared to existing designs to see the change.

"The first process is extracting geometric cost drivers from the CAD model," says Burke. "We then have to build within the software 'virtual production environments' (VPEs). Like a real manufacturing factory where you have machines, raw materials, finishing, labour, electricity, light, heat and so on. We take everything: all these various elements and capture them in the software."

There are nine starter factories that act as templates for customers to create their very own accurate and bespoke VPE. The starter factories represent different geographies around the world such as Brazil, China, Eastern Europe, USA, and Europe, and vary labour and overhead costs appropriately, though these can later be adjusted to reflect the exact values of a given factory. Companies then add material costs as buying power varies greatly depending on the company size, and up-to-date real costs to make the system representative.

Not just a design tool

As well as being useful for designers to get a handle on cost early on, the software can be used elsewhere in a company to help quicker strategic decisions to be made. "If you need to make a decision on whether to make or buy a component, you can take the 3D model and run it through aPriori," says Burke. "You might see it costs £45 to make in the UK factory and £25 by a supplier in Brazil. Then it will factor in transportation and logistics and you can compare the 'landed cost' of site A vs. B. That allows you to make quick and accurate strategic decisions about what to make in house or what to buy from a supplier."

The limitation on the software at the moment is complexity. Processes such as composite production are not yet available as standard. However, the company says it is in a state of evolution and continues to develop new cost models.

"We have got the easy ones out the ways and are now working on the harder ones," says Burke. "Investment casting and composites are both on our road map."

www.apriori.com

www.iveco.com/uk



Join us on 24th October at 8 Northumberland Avenue, London, to celebrate British Engineering Excellence

Now in their fifth year, the **British Engineering Excellence Awards** have given many products, people and companies the recognition they deserve!

To book a table, contact Julie Knox on 01322 221144
or visit www.beeas.co.uk



Organised by



EUREKA
newelectronics

Headline sponsors



Gallery sponsor



Sponsors



anglia



british engineering excellence awards

www.beeas.co.uk

Growing nano applications

A light absorbing carbon nanotube coating is set to enable space instruments to become much more powerful. Justin Cunningham finds out how.

A team from NASA has successfully grown uniform layers of carbon nanotubes using another emerging technology called Atomic Layer Deposition (ALD). The marriage of the two technologies means that nanotubes can now be grown on three-dimensional components such as complex baffles and tubes.

"The significance of this is that now we have a tool that can make instruments more sensitive without making them bigger," says lead engineer on the project, John Hagopian. "This demonstrates the power of nanoscale technology, which is particularly applicable to a new class of less expensive small satellites called CubeSats that are being developed to reduce the cost of space missions."

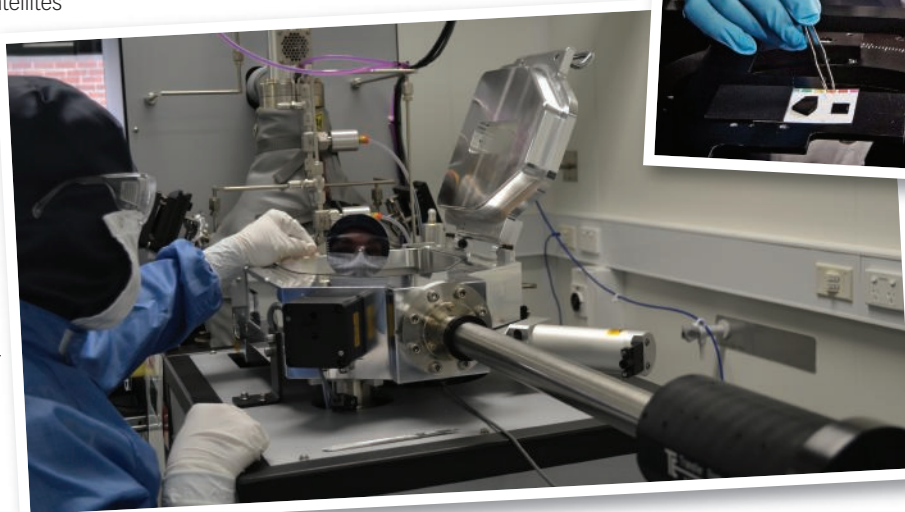
The resultant material absorbs more than 99% of the ultraviolet, visible, infrared and far-infrared light that strikes it, which has never been achieved to this level before. It is the culmination of five years work by Hagopian who has been able to 'tune' the nano-based super-black material for practical applications that require the suppression of stray light. An example is a part used within the sensitive detector of a powerful telescope known as an occulter. This is an intricately-shaped small disk used to block bright objects in order to allow the observation of fainter ones.

The material consists of a thin coating of multi-walled carbon nanotubes 10,000 times thinner than human hair. The team is able to grow 'forests' of vertical carbon tubes on common materials such as titanium, copper and stainless steel. Tiny gaps between the tubes collect and trap light, while the carbon absorbs photons preventing any reflection off the surface.

One of the major challenges before growing the nanotubes is the need to deposit a highly uniform catalyst layer of iron oxide to support the

nanotube growth. Using ALD, technicians place the substrate material inside a reactor chamber and pulse different types of gases to create layers of ultra-thin film, each no thicker than a single atom. ALD allows technicians to accurately control the thickness and composition of the deposited films, even inside pores and cavities. This gives ALD its unique ability to coat inside and around 3D objects.

Once applied, scientists can then grow the carbon nanotubes by placing the component in another oven and heating the part to about 750°C. As it heats, the component is 'bathed' in a



Above: John Hagopian, the lead engineer on the NASA Atomic Layer Deposition project

Left: Nanotubes can now be grown on components such as complex baffles and tubes

feedstock gas containing carbon.

"The samples we've grown to date are flat in shape," says Hagopian. "But given the complex shapes of some instrument components, we wanted to find a way to grow carbon nanotubes on 3D parts, like tubes and baffles."

"The tough part is laying down that uniform catalyst layer. That's why we looked to atomic layer deposition instead of other techniques, which only can apply coverage in the same way as spraying paint from a fixed angle."

Collaboration with the Melbourne Centre for Nanofabrication (MCN) was able to fine tune the process for laying down the catalyst layer further,

with precise methodology being developed to enable the reliable and repeatable deposit of a uniform coating.

Lachlan Hyde an expert on ALD from MCN says: "The iron films that we deposited initially were not as uniform as other coatings we have worked with, so we needed a methodical development process to achieve the outcomes that NASA needed for the next step."

Now this has been achieved, Hagopian concludes: "This has really opened up the possibilities for us. Our goal of ultimately applying carbon-nanotube coatings to complex instrument parts is nearly realised."

www.nasa.gov

Growing innovation

Getting automotive technologies to market requires funding that is hard to justify to potential investors. So how can potential start up companies be successful? Justin Cunningham finds out.

Getting investors excited and interested in any start-up business is a difficult task. However, mention the automotive industry to many and you will get laughed out of the room. The industry well documented as being a difficult and heavily-regulated market.

Automotive components require substantial physical testing, are expensive to develop and can take ten years to get to market. It is risky stuff and many have had their fingers burnt over the years. For this reason, many innovations come from the internal R&D departments of larger OEMs and not from smaller technology start-ups.

The problem is not a shortage of ideas, but rather the ability to fund their commercialisation. Indeed the UK is well known for small-scale invention, innovation and elegant

engineering, but just as well known for not being able to commercialise and capitalise upon them.

"That stereotype has some substance but I don't think it has ever been quite as bad as that," says Professor Geoff Callow, managing director of Turquoise Engineering Consulting, part of the merchant bank Turquoise International. "We appreciate in the motor industry that we need to raise our game and in particular with regard to CO2 regulation."

This legislation on tailpipe emissions has created fresh opportunities and is getting investors to reassess the potential. The tough targets set for 2020 and 2025 have unintentionally created a stable and predictable demand within the industry.

"New products are not just driven by ideas

and innovation, they are determined by the market," says Professor Callow. "These regulations have had considerable impact on investors and have also focused the minds of industry. The legislation has removed a lot of uncertainty."

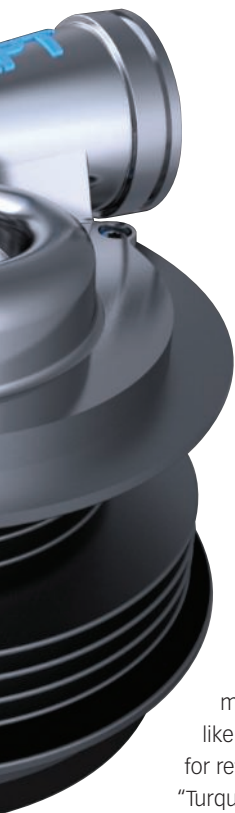
Turquoise tends to work with start-up companies run by engineers with experience of the automotive sector and that are some way in to the development process. Initial funding for conceptual and start-up development is often relatively straightforward: usually achieved through a research grant or the Technology Strategy Board (TSB). However, turning concepts and prototypes into a commercial enterprise is far more challenging.

This second stage of funding is notoriously difficult and is known as the 'Valley of Death'. Though this stage of business development cannot be underestimated, the outlook generally for the UK, despite the recession, is quite strong.

Vehicle manufacturers are hungry for innovation and are increasingly looking at how they can differentiate themselves from competitors. This means the market is perhaps more keen to acquire new technologies than it has been in the past. Investors are quick to forget problems of the past when a lucrative opportunity presents itself.

Despite this, funding for automotive technology must compete against other business models that can offer a much quicker return. The hard truth however, is that ultimately





there is simply not enough money around to support the ideas that deserve support and many investors prefer something like a digital app because of time for return and associated risk.

"Turquoise looks for companies that have thought through the route to market and identified the all-important moneymaking opportunities along the way," says Professor Callow. "The journey to mainstream automotive adoption can take years so businesses need to work out when and how returns can be achieved to satisfy investors."

Manufacturing readiness

Getting ideas from concepts to CAD models to prototypes and then into small-scale production must be done relatively quickly, and start up companies must be able to demonstrate that they are dynamic in that respect.

One company that has been successful in making the leap is Essex-based Control Power Technologies (CPT). The company uses switched reluctance motors to allow the micro-hybridisation of vehicles with a bolt-on solution. Its products include an electronically-controlled supercharger, an advanced stop-start system and an exhaust energy recovery system.

CPT sprang out of a project by tier 1 automotive supplier Visteon. However, a change in strategy left the technology marooned. This presented the opportunity to buy the technology, get investment and set up a company. "Aware of the CO₂ precipice that the industry is facing, this was a clear way of dealing with it," says Professor Callow. "The technologies had already had quite a lot of investment and it was recognisably on its way.

"The products look like they are from a car. That may sound trite, but if a product based on new or emerging technology looks unfamiliar to

an automotive engineer it becomes a significant hurdle to overcome. These look like starter motors or alternators. Automotive engineers very quickly understand them and that makes them easier to sell."

Venture capitalists that fund early-stage, start-up technology ventures are in short supply so think very carefully about what the ultimate commercial proposition is and how to get the technology to market.

"It doesn't matter how good the technology is from an engineering perspective," says Ian Thomas, managing director of Turquoise International. "There are a lot of great designers and engineers in the context of big companies, but being on your own without that resource is a very different environment. You have got to be sure you can adapt."

The most successful automotive start up companies combine a genuine engineering innovation with a really objective, clear-headed analysis of how to make money as an independent business. Large companies usually have a dedicated sales workforce to help launch new products, but smaller companies need to ask: 'once a product is developed what happens then?'

Though not always the case, often the engineer responsible for the technological innovation is not necessarily the best person to head up the company. Involving someone from the commercial side with experience of taking a technology and turning it in to money can be invaluable.

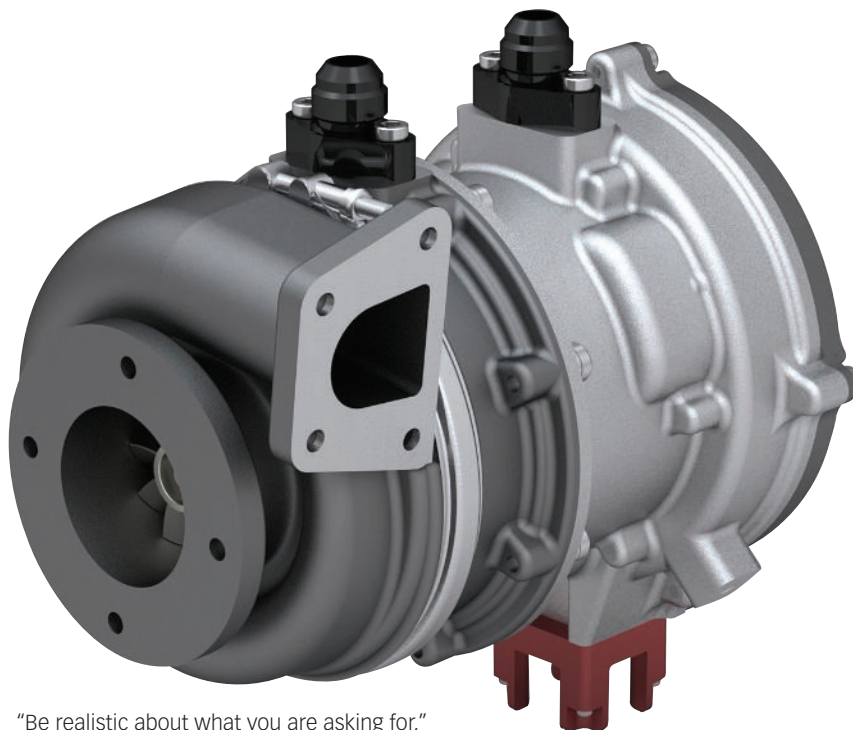
While a fundamental belief in a business is vital, it is essential to be realistic and pragmatic



when approaching investors. Many are not, particularly when it comes to the financial evaluation.

"You may convince yourself, – or be convinced – that the development process is going to be quick and cost just a few million, when it might be eight years and cost £30million," says Thomas. "Don't get seduced by the technology you've come up with. A couple of patents are never going to be worth £50m and the minute you say that, people won't like it. That is part of our role to advise you on a realistic evaluation based on experience."

It is always advisable to get more than one investor and that is why merchant banks like Turquoise are helpful in matters such as raising funds and finding investors. Choosing the right investors that are both sympathetic – so as not to get too twitchy too soon – and also experienced in particular fields, applications or technologies is vital.



"Be realistic about what you are asking for," says Thomas. "You need a plan that really reflects reality, which is well costed. You can't go and ask for five times the amount of money that you need as you won't get it. Equally, don't cost on the basis that everything has to go right first time."

"You have to strike a balance. You can't

make it riskless, but don't make it too risky. Be patient. Raising funds in this market will take time. It is a hard road, particular in these tough times, but it can be done, you just have to know what you're letting yourself in for."

www.turquoiseassociates.com

Technology readiness levels (TRLs) and Garner's hype cycle

Technology readiness levels (TRLs) came out of NASA in the 1980s to define the maturity level of a technology. TRL 1 is an idea and maybe some simple experiments to show the principles are correct. TRL 8 or 9 means the system works properly under expected conditions and it is ready to go in to production. It is being adopted by the automotive industry to avoid people over or under talking where new technologies are at.

"TRL 4 to 7 can be the 'Valley of Death' in terms of funding," says Steve Sapsford, global market sector director for high-performance vehicles and motorsport at Ricardo. "Universities and TSB funding might get you through TRL 1 to 3 and at TRL 8 to 9 you are in production. But who is going to pay for this industrialisation?"

The Garner hype cycle highlights why it can be easier to get funding at the front end but difficult late. As a technology begins development everyone is enthusiastic about the possibilities. Examples include fuel cells, 3D printing and graphene – where everyone is speculating about the possibilities.

Like fashion, people jump on the bandwagon. Policy makers often look for simple solutions that make good headlines and investors put money in with unrealistic expectations of technology

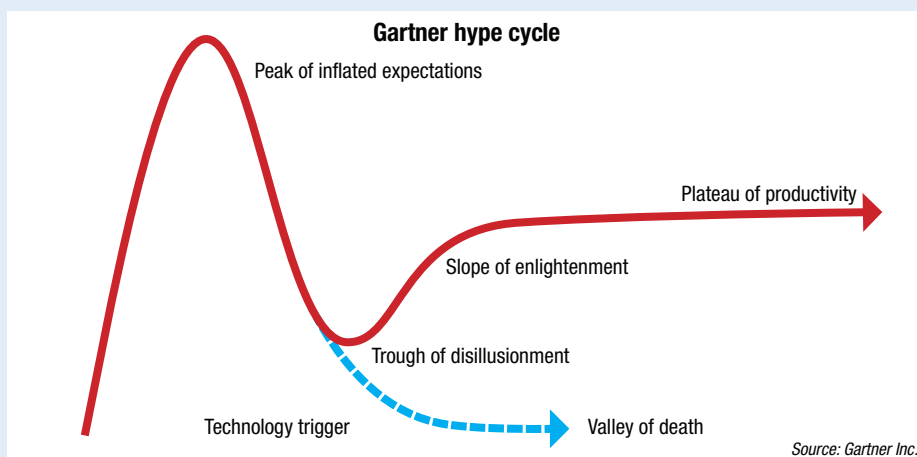
maturity and timescale for a return of an investment.

This builds up to a peak of inflated expectation. Reality kicks in and development actually proves a lot harder and more costly than first thought. Enthusiasm wanes and people are disenchanted. This then leads to the tough of disillusionment. "If someone figures out the clever bit that makes it cheaper, simpler, or more efficiently the enthusiasm comes back up again through the slope of enlightenment," says Sapsford. "This then levels off at the plateau of

productivity which is where the whole thing should have been in the first place."

If a breakthrough doesn't happen it can often spell the death for any future funding and of the technology. What this graph essentially says for funding is that when looking for funding it can be easy to get when early on when everyone is enthusiastic. That will enable some engineering and development but often it will show the technology is a lot harder to refine than you first thought.

www.ricardo.com



The 8th UK Altair Technology Conference 2013

'The UK's Leading Virtual Design Conference'

Showcasing Innovation in Virtual Design



10th September 2013 - Heritage Motor Centre, Gaydon, Warwickshire

Virtual design is increasingly vital in delivering competitive products. The 8th Altair Technology Conference will demonstrate how leading UK companies are using virtual design to successfully meet their engineering and business challenges

Cutting Edge Technical Papers Presented By



BAE SYSTEMS



Gestamp

PLAXTON



And Many More...

Secure your **FREE** place now at

www.altairhtc.com/uk



Altair

Agenda subject to change

3D Printing



www.slice3d.com

Prototyper offers one-stop solution

Offering prototype solutions for the consumer market, Slice 3D is a one-stop solution, 3D model printing service. It offers friendly staff; advice if you need it; a broad selection of materials, including two rubbers; and two resolutions: fine 13 or 24 micron. The company also offers a file check service, fast turnaround and speedy delivery.

A no-obligation quote is also available.

@: enquiries@slice3d.com

☎: 01782 641586

Adhesives



www.loctitesolutions.com

Loctite® and Teroson for 360° Structural Bonding

Structural adhesives offer significant advantages over traditional fastening methods.

They increase the durability and reliability of products all around us, and Henkel leads the field. If it's technically possible Henkel can provide the solution. It has a structural bonding product for every application – in short, 360° bonding.

More at www.360bonding.com



@: technicalservice.loctite@henkel.com

☎: 01442 278100

Ball Knobs

New Stainless Steel & Aluminium Ball Knobs from Rencol Components

Manufactured in highly polished stainless steel or aluminium and available in 58 diameter and thread combinations! These heavy duty knobs are suited to demanding environments and applications where hygiene is paramount including medical, pharmaceutical, catering and marine. Either component offers an attractive, high quality finishing touch to your project.

Rencol offers immediate stock availability and large quantities are a speciality thanks to our international manufacturing partners and mature supply chain.



www.rencol.com

@: sales@rencol.com

☎: 0117 916 0090

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° 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

@: sales@ws2.co.uk

☎: 01430 861222

Configurators

Bifold, Official Partner of the Marussia F1™ Team have developed sophisticated configurators to make valve selection effortless

Unique Valve and Manifold Configurators

With Bifold, you can use our unique online drag and drop Modular Manifold Configurator to design highly bespoke manifold systems effortlessly. The manifold can be designed from the circuit sequence down to the orientation of individual modules to your exact specification.

You can use our Valve Model Configurator to create the valve you require and download a bespoke configured datasheet with a single click. The 3D CAD model is then automatically emailed. The datasheet contains a tracking image which enables you to view the rendered image in real time, in augmented reality and to scale using the Bifold Model Viewer.

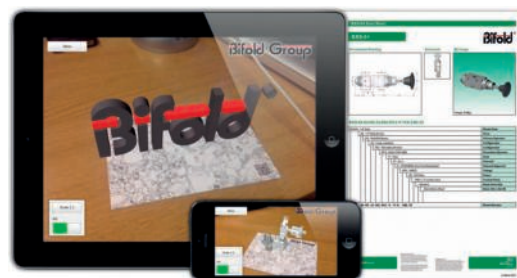
Effortless Selection Process

1. Configure your product
2. View interactive 3D model online
3. Print bespoke data sheet or save to your system
4. Receive 3D CAD model by email
5. Contact sales department with your order

Visit us at Offshore Europe 3rd - 6th September 2013, stand number 3B60.

@: gbancroft@bifold.co.uk

☎: +44 (0) 161 345 4777



www.bifold.co.uk

Dowels

Ground Hollow Dowels for Precision Alignment and Substantial Cost Savings

Spirol Ground Hollow Dowels are designed to be direct replacements for standard Ground Solid Dowels in accordance with ISO 8734. They are used where centreline tolerancing and precision alignment are required.

Their precision ground outside diameters maintain critical alignment within 20µm. A 1.6µm surface finish and well-defined chamfers prevent shaving or scraping during installation. The roll-formed design yields substantial cost savings over Solid Dowels whilst their hollow feature offers weight savings over Solid Dowels and clearance for bolts, fluids, or gases.

For example, an OEM was using a 16mm outside diameter Ground Solid Dowel to locate the transmission to the back of the engine. This particular application was more demanding than most due to the weight of the two components to be aligned and the method of joining them together.



www.spirol.com

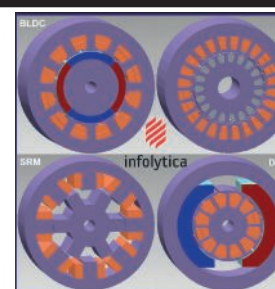
@: uksales@spirol.com

☎: +44 (0) 1536 444800

Electromagnetic Design Software

Infolytica state-of-the-art Electromagnetic design software

Infolytica state-of-the-art Electromagnetic design software is used worldwide by Engineers in a wide range of industries including electro-mechanical, non-destructive testing (NDT), induction heating, sensors, industrial transformers. Infolytica also offers a truly innovative design tool – MotorSolve – for IM, SRM, Brushed and Brushless DC motor design. It has built-in thermal analysis including various cooling strategies, and can couple to 3rd party software, for example OPAL-RT for Hardware-In-Loop real time analysis.



www.infolytica.co.uk

@: sales@infolytica.co.uk

☎: 01327 810383

Enclosure Solutions

Smartboxx – the smart choice

Free prototypes, easy scale up to production, no additional design costs or lag time and a wide range of durable materials make Smartboxx the smart choice to help accelerate product development, improve design quality and reduce costs.

With many years of engineering experience, Smartboxx designers, engineers and the assembly team, manufacture enclosures from flat sheet materials using bespoke CNC equipment to produce enclosure solutions for a wide variety of industries and applications.

Prototypes can be created within a week whether you come in with just an idea, CAD/CAM drawings or rely on Smartboxx designers to meet your IP rating or access requirements. Don't compromise on the size of your PCB or the location of your 'through components' as you would with a customised moulded enclosure.

There are no tooling costs in the proprietary process, making it ideal for low quantity production or one-off units. Scaling up to higher volumes utilising the same technology makes for a seamless transition into volume production with no additional costs. Stock materials include ABS, HIPS, Acrylic, PETG, Polypropylene, Polycarbonate, Polyethylene and Acetal. Secondary processes include material laminating, screen printing and painting, along with internal RFI and conductive coatings.

For FREE* development of your enclosure just quote tracking code 131 when you call.

*Subject to Terms & Conditions

@: info@smartboxx.co.uk

☎: 01842 766557



www.smartboxx.co.uk

Hydraulic industrial shock absorbers

Innovative Deceleration Technology

Slam Proof Ltd is the UK distributor for German manufacturer Weforma Dämpfungstechnik GmbH. The product range includes hydraulic industrial shock absorbers, rotary dampers, deceleration cylinders, hydraulic speed controls, pallet stoppers and gas springs. Also, for vibration isolation we can offer air springs, metal cushions and polyurethane buffers.

Weforma's success is based on their development of modifications and customised solutions. A modern production facility enables even the largest heavy duty shock absorber or stainless steel high torque rotary damper to be manufactured within a short lead time.



SLAM PROOF
SPECIALISTS IN HYDRAULIC SOLUTIONS

Weforma
Dämpfungstechnik GmbH

@: info@slam-proof.co.uk

☎: 01772 865784

www.slamproof.co.uk

Linear and Rotary Motion Supply



LMB Transmissions

At LMB Transmissions we bring a fresh approach to Linear and Rotary Motion Supply. We understand the importance of a rapid response while offering technical support to ensure correct product selection first time.

LMB Transmissions represent and stock products from world class manufacturers including HIWIN, IBC & CODEX.

Unit 7 Business Centre West, Avenue One, Letchworth, Hertfordshire SG6 2HB

@: sales@lmbearings.com

☎: 01462 675033



codex



HIWIN

www.lmbearings.com

Metering Pumps

Integrated Electronic Control for Hydra-Cell P200 Diaphragm Pump

Wanner International is now offering integrated variable speed drive with its Hydra-Cell P200 metering pumps.

The innovative design combines an AC induction motor with a variable speed drive (inverter) mounted on the motor in a terminal box. Combining the motor & drive together is claimed to be simple to use while being highly accurate and repeatable. The compact design and low weight of the unit complements the small size and footprint of the Hydra-Cell P200 metering pump. The ATEX approved, IP65, class F variable frequency drive system is easy to set up and adjust through a local analogue control knob, graded from 0 to 100%.

Because Hydra-Cell pumps are true positive displacement pumps, flow rate is directly proportionate to input shaft speed and virtually independent of system discharge pressures.



@: sales@wannerint.com

☎: +44 (0)1252 816847

www.hydra-cell.eu

Water technology

Brunel BEng Mechanical Engineering students win Xylem's Engineering Insight programme

Engineering Insight, an initiative set up by leading global water technology provider Xylem Inc., manufacturer of a global brand portfolio, including Midland-ACS, a leading supplier of control systems to the oil and gas industry, sponsored Brunel University's "Made in Brunel" event in London last month following the success of a group of Brunel BEng Mechanical Engineering students in Xylem's Engineering Insight scheme. The Engineering Insight initiative was set up by Xylem to promote closer links between industry and mechanical engineering students at leading universities and IMechE accredited institutions. The Brunel team undertook a real-life engineering challenge from Xylem engineers to re-design a pneumatic regulator valve used on offshore oil production facilities, adding functionality and further safety features.

For further details on Engineering Insight, see www.engineeringinsight.co.uk.

For further information on Xylem please visit: www.xylemflowcontrol.com

@: www.xylemflowcontrol.com

☎: +44 (0)1992 450145



www.xyleminc.com

Rivets

The HuckLok® structural blind rivet

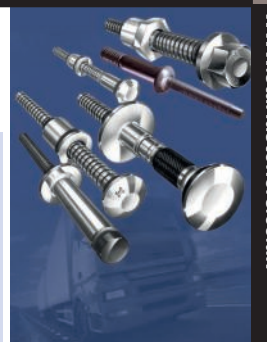
Featuring a wide grip range and unique double-locking action, the HuckLok® blind steel rivet combines high shear strength and high pull-up force. Its double-locking action consistently secures the assembly from both sides, resulting in maximum hold and joint integrity. It's large, blind-side footprint prevents pull-through, especially when joining thin or lightweight materials, such as plastics, composites, or any kind of pliable material. For even the most challenging assembly applications, the HuckLok® blind rivet is the strongest most versatile structural blind fastener you can use.

- A wide grip-range 2mm-31.8mm accommodates large variations in joint thickness.
- Unique bulbing system for superior blind side strength.
- Large, blind-side footprint prevents pull-through.
- Positive mechanical internal pin retention ensures structural integrity.
- Annular grooves keep pressure on the back side.
- Quick and easy visual inspection.
- Available Sizes: 3/16", 1/4".

Star Fasteners stock high performance and quality fasteners for a wide variety of applications.

@: sales@starfasteners.co.uk

☎: +44 (0) 115 932 4939



www.starfasteners.co.uk

A noise annoys

Want to cut down on noise in restaurants but still hear your dining companions? Maybe Coffee Time Challenge can help?



What could be nicer than a nice evening out at a restaurant? Good food, good wine and good company: who could ask for more?

However, a problem can arise with the last of this trinity. Because, while our chosen dining companions may be delightful, we cannot necessarily legislate for those others who are dining in the same establishment. How many of us have sat down, perused the wine list and ordered aperitifs only to realise with mounting horror that the table next to us contains people with voices, volume, views or – worst of all – children that leave us gripping the steak knife white-fingered with murder on our minds?

Once upon a time, what one feared in a restaurant was someone who lit a cigar or cigarette, enveloping one in lungfuls of fuf as one attempted to enjoy a delicately-flavoured consommé. However, that menace having been dispatched by legislation, the greatest fear now is the noisy neighbour.

Of course, the problem cuts both ways. Occasionally, one may wish to discuss something private with a dining companion, only to realise that one's neighbour is taking the

opportunity to acquaint themselves with the details of your private life.

The Challenge

So can technology help? Is there a means whereby diners can eat in privacy and seclusion in a busy restaurant? A number of ideas spring to mind. For instance, could one install Perspex tubes that descend from the ceiling to enclose the table. These could either be activated by the diners themselves or by their

neighbours should enough of them request that it happen.

While this solution would serve the purpose, it is hard not to feel that the diners may object to being enclosed against their will, potentially harming the restaurant's chances of a repeat booking. Equally, such an installation may be prohibitively expensive for all but the most exclusive restaurants.

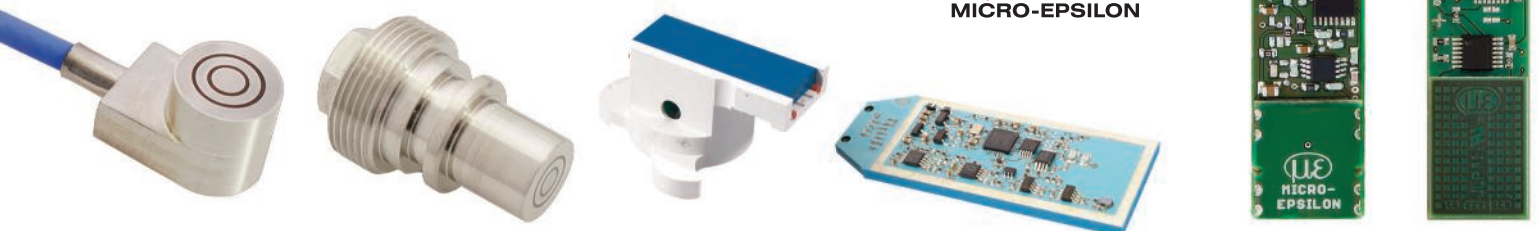
In fact, the solution we have in mind is relatively low-tech, but surprisingly elegant and effective. However, there is nothing to say that it is necessarily the best available. We are very keen to see if *Eureka's* readers can come up with something better.



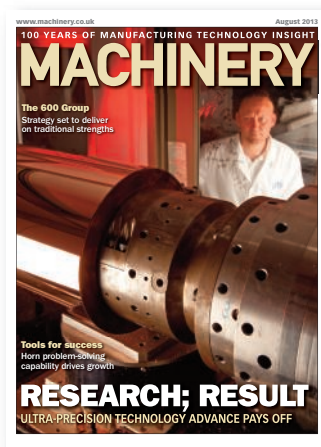
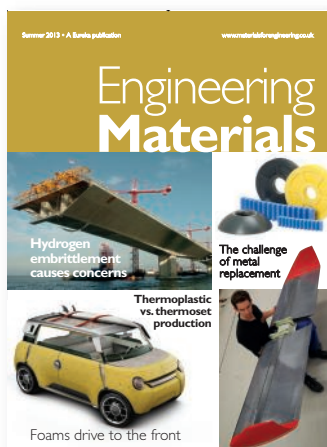
The answer to last month's Coffee Time Challenge of how to make it safer to cycle on the roads at night can be found in our Technology Briefs section on page 12.

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.



Inspired by innovation



Passionate about engineering

“To have a great idea,
have a lot of them.”

Thomas Edison

Make more of
your ideas at...

Engineering Materials LIVE!

- Inspiring keynotes from design leaders
- See the latest innovations from 200 exhibitors
- Enhance your knowledge through practical workshops

3 Events • 2 Days • 1 Free ticket

2-3 October 2013 • Jaguar Exhibition Hall • Ricoh Arena • Coventry

Register now for regular updates @ www.engineeringdesignshow.co.uk

Headline sponsors

HEIDENHAIN
The measure of excellence



Co-located with

Engineering
design show

electronics
design show