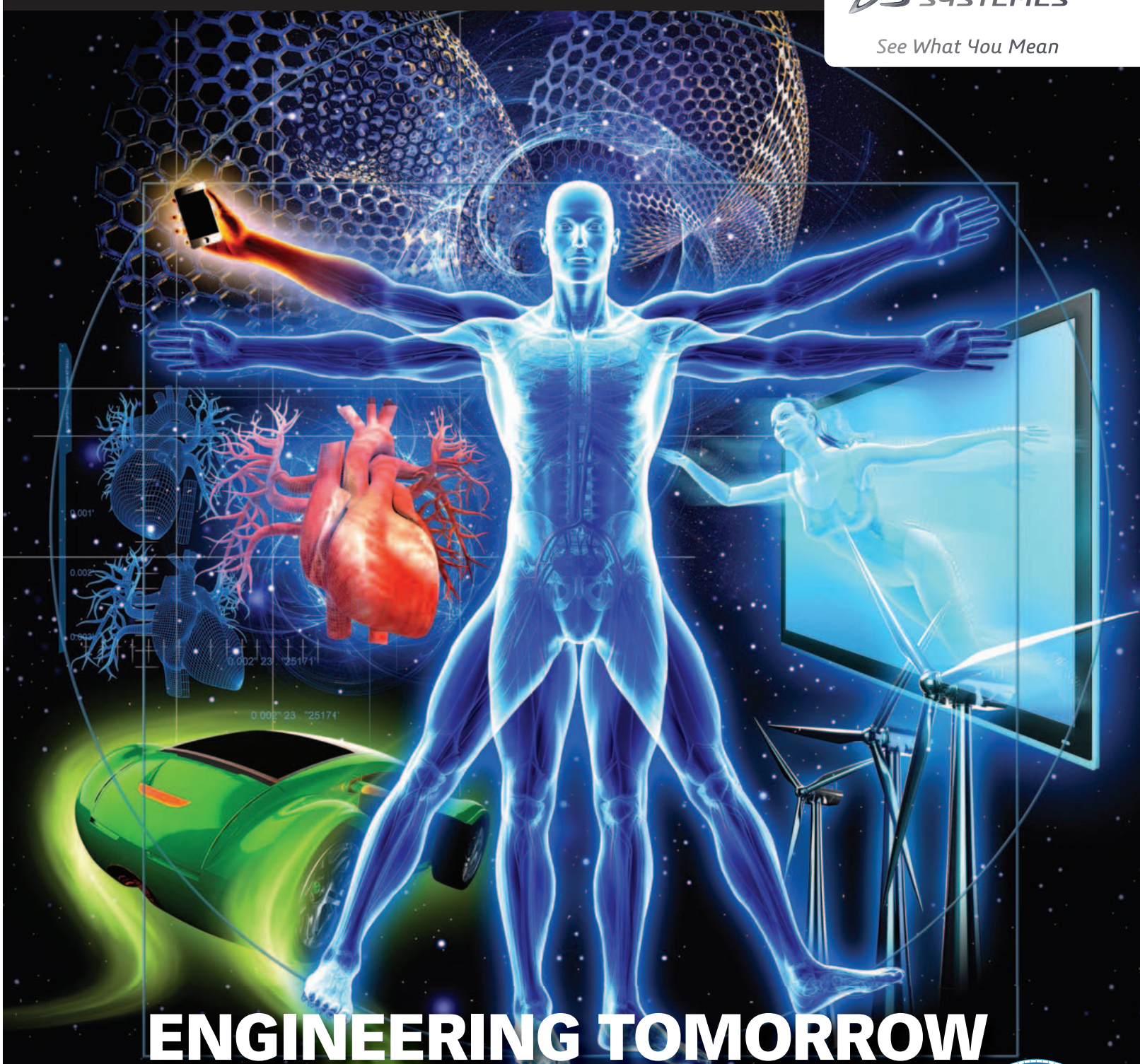
EUREKA

THE MAGAZINE FOR ENGINEERING DESIGN

Eureka's 30th Anniversary Issue – sponsored by



ENGINEERING TOMORROW

Where can technology take us?

In this issue: Design Software • Drives, Controls & Automation • Power Transmission

"What about putting a gym in the plane?"

Laura, age 10

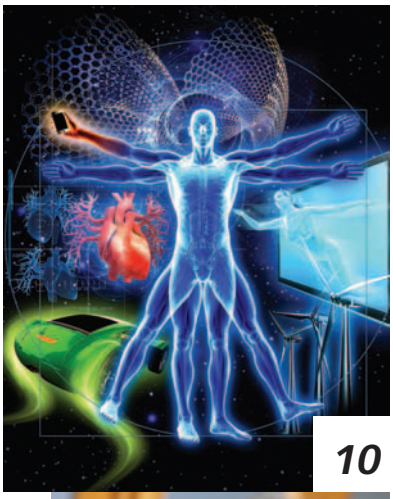
With 3D, your customers are your best designers.
Working in 3D lets you integrate your customers' preferences into your project more easily than ever, even online. Together, you can create, share and experience your ideas - all in 3D. With Dassault Systèmes solutions, your company is empowered by a new, universal language to invent the products of the future.

Discover SolidWorks, CATIA, SIMULIA, DELMIA, ENOVIA and 3DVIA **at www.3ds.com**

DASSAULT SYSTEMES

CONTENTS

Volume 30 Number 12 December 2010

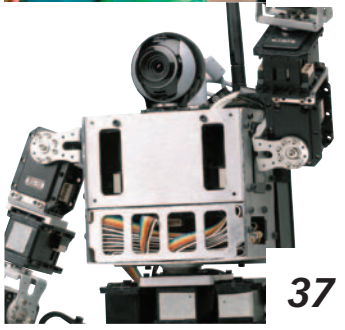


10

14

16

18



37

www.eurekamagazine.co.uk

PKR Series Uninterruptible Power Supplies

- Ideal for IT or Telecomm applications, etc
- 2U, 4U & 5U 19” rack mounting or free standing
- 5 models with output ratings of 1KVA, 2KVA, 3KVA, 6KVA & 10KVA
- Online double conversion technology with pure sine wave output
- Available with either 230VAC or 115VAC 50/60 Hz inputs and outputs
- High input Power Factor
- Automatic Bypass as standard
- Intelligent RS232 communication port
- Comes with UPS management software as standard
- External SNMP, USB or Dry Contacts optional
- LED and LCD display shows operating parameters
- LCD display can rotate for vertical or horizontal mounting
- Fitted with Yuasa NPW45 series batteries as standard for enhanced reliabilty and hold up time, optional 10 year life batteries can be fitted
- Additional battery racks available for extended hold up time
- 5 years warranty period

- EMC conforms to EN61000-3-2, EN61000-3-3, EN50091-2, CE marked
- Safety conforms to EN62040-1-1 for UPS Systems, CE marked

POWER SOLVE

www.powersolve.co.uk

Tel: 01635 521858 Email: sales@powersolve.co.uk

Editor
Paul Fanning
pfanning@findlay.co.uk

Group Technical Editor
Dr Tom Shelley (PhD, CEng)

Group Editor
Graham Pitcher
gpitcher@findlay.co.uk

Web Editor
Chris Shaw

Online Editorial Assistant
Laura Hopperton

Art Editor
Martin Cherry

Technical Illustrator
Phil Holmes

Advertising sales
01322 221144

Sales Manager
Luke Webster
lwebster@findlay.co.uk

Account Manager
Tricia Bodsworth
tbodsworth@findlay.co.uk

Sales Executive
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

ISSN-0261-2097

Eureka (incorporating Engineering Materials and Design and Design News) is free to individuals who fulfil the publisher's criteria. Annual subscriptions are £78 UK (£115 overseas or £150 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
CTT
Printed in England by
Wyndeham Heron Ltd

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

Meeting the future's needs

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

Of all the things that have changed in the 30 years since Eureka's first issue hit desks, the shift in the UK's industrial landscape is probably the one that has had the greatest impact on readers.

In 1980, the UK still operated many large, heavy engineering sites across the country employing many thousands from the local areas. Today, with some notable exceptions, those sites are largely gone.

This has led to the common misconception that 'we don't manufacture anything anymore'. In fact, misconception isn't a strong enough word for this belief: it's just plain wrong. What is undeniable is that manufacturing and engineering have changed beyond all recognition in 30 years. The numbers employed have shrunk as the technologies employed have become more smarter and more efficient, but manufacturing is still very much here.

Of course, this change has made ever greater demands of design engineers. When the question is 'can we do this better, cheaper and more efficiently?', it is usually asked of design teams first and foremost. The remarkable thing is how often designers come up with the right answers.

Having better ideas, methods and resources is the key to the UK having a successful manufacturing economy. *Eureka* has always sought to reflect this process and, where possible, to encourage it. It would be absurd to make too many grandiose claims on behalf of this magazine, but it is our hope that, of the numerous great ideas that UK engineers have had in the last 30 years, some of them may have been inspired, encouraged or influenced by something somebody read in these pages.

It is even nicer, of course, to think that there are innovations out there that we have yet to inspire, encourage or influence.

Here's to the next 30 years.

From napkin sketch to prototype in just weeks. Let's see what we can create in SolidWorks®

You and your fellow designers are going to help Jeremy create some never-before-built products. You'll submit projects, share design ideas and vote on key design decisions. If you think you're ready, let's go design. **Watch. Share. Vote.** LetsGoDesign.tv

LET'S GO DESIGN

AN INTERACTIVE WEB SERIES

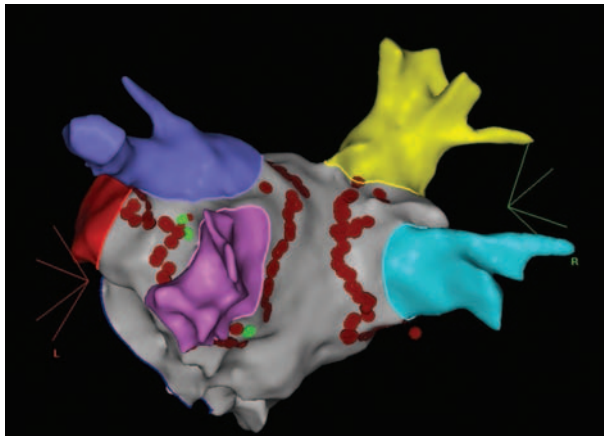
LetsGoDesign.tv

presented by SolidWorks

Robot enables remote heart op

The world's first remote heart procedure, using a robotic arm alongside 3D mapping, is due to take place at Glenfield Hospital in Leicester.

It comes six months after Dr Andre Ng, senior lecturer at the University of Leicester and consultant cardiologist and electrophysiologist at Glenfield Hospital, carried out the first ever remote catheter ablation procedure using the Amigo Robotic Catheter System.



Dr Ng will be carrying out the procedure using the robotic arm, in combination with advanced 3d mapping, to fix an irregular heart rhythm called atrial fibrillation (AF). AF is the commonest heart rhythm disturbance seen in clinical practice, with more than 500,000 sufferers in the UK. It also increases the risk of a person having a stroke by five times.

Dr Ng said: "The new Amigo robotic system we have at Glenfield is unique and a new improved version of the original system which can now be used with different types of catheters, especially allowing the combination with the CARTO-3 3d mapping system. CARTO-3 is the latest version of the established and widely used advanced mapping and navigation system which displays and guides precise location of catheter positions in 3D space. We are the first centre in the world to use this new Amigo system and hence the first to be able to combine the two cutting edge technologies for the ablation procedure."

Letter to the Editor

Sir

Your comment 'It's not about sheep and goats' is precisely what has to be said and listened to if British industry is to survive the next generation.

I went to a Technical School in 1956, the McEntee Technical School in Walthamstow, whose entry requirement was a good 11-plus pass. Several of the staff wore cap and gown through out the working day. The results at A level (real A levels) were excellent and we were educated to think and apply basic principles to solve problems. Exams were a bit harder, but in later life we were seldom stuck for a solution to problems; given time, we could solve anything. That was real worthwhile education. Shortly after I left, it went 'comprehensive' and standards dropped through the floor in a matter of a few years.

My wife's brother in law is Vice Chancellor of a University and her family sees 'academia' as far superior to vocational and technical education. Engineers are, to them, grease monkeys in car repair shops.

Having worked in Germany, where the term engineer is properly protected, I fully agree with the way Germany operates its education. That was Dusseldorf in 1971 to 1972 and scores of business trips afterwards for both Multitone and Unilever.

In 1967, I was on a training course in East Germany on the servicing and repair of electronic desk calculators (www.soemtron.org) manufactured there and imported by my then employer Office and Electronic Machines. The emphasis that Germany traditionally put on good and thorough technical and vocational training of staff was obvious. Even in the somewhat 'distorted' economy of the East German regime, the attention to good education had survived.

Yours sincerely
Bernard Green
Sharn Nook
Sharnbrook
Bedfordshire

Briefs

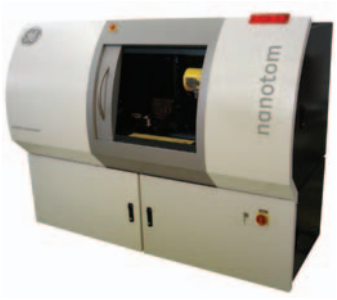
AUTOMATION ADVISORY SERVICE LAUNCHED

The Automation Advisory Service (AAS) has been launched to provide companies with access to knowledge and expertise to ensure the most appropriate and cost effective solutions are developed and implemented. AAS will initially offer an audit of the client's existing manufacturing operations, focused on identifying realistic opportunities to improve the productivity, consistency, quality, yield and potential for reductions in waste and rework as well as improvements in health and safety. The results of the audit are then compiled in a detailed report, highlighting the actions required to increase competitiveness and raise profitability, which is then reviewed with the client.
www.automationadvisoryservice.com

NEW RECIPIENT OF FARADAY MEDAL

The Institution of Engineering & Technology (IET) has awarded the Faraday Medal, its most prestigious award, being presented to Professor Donal Bradley CBE FRS. Professor Bradley received the award at an exclusive ceremony in recognition of his icontributions to the development of plastic electronics.
The Medal, awarded for the 88th time, is given for notable scientific or industrial achievement in engineering or for conspicuous service rendered to the advancement of science, engineering and technology.
In his roles as Director of Imperial College London Centre for Plastic Electronics and co-founder and director of Molecular Vision Ltd, Professor Bradley has pioneered a number of innovations in plastic electronics.

3D metrology for wide sample range



The phoenix nanotom m, from GE´s Inspection Technologies business, has been developed to fulfill the fast growing demand for high resolution and high precision X-ray computed tomography (CT) in non-destructive 3D analysis and 3D metrology. Featuring fully automated CT scan execution, volume reconstruction and the analysis process, it offers ease of use as well as fast and reproducible CT results, in applications ranging from small biological and geological samples to medium sized industrial components such as injection nozzles or injection molded plastic parts, even with metal inlays.

The nanotom m incorporates a new phoenix 180kV/15W, high-power nanofocus X-ray tube, which is optimized for long-term stability and allows scanning of high absorbing materials such as metals and ceramics. The internal cooling of the tube also significantly reduces thermal effects such as drift, to ensure even sharper imaging as well as allowing the long scanning times frequently required in scientific research.
www.ge.com/energy

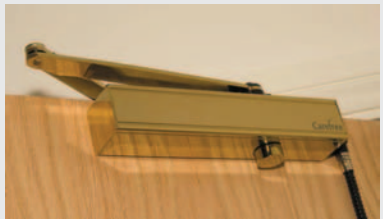
Solution to last month's Coffee Time Challenge

The solution to our November Coffee Time Challenge is the brainchild of Mark Batt-Rawden, who has developed a series of door closing products suitable for use in care homes under the 'Holdfire' brand name. The latest and best of these is the 'Carefree Plus'.

His solution is essentially a hydraulic cylinder, with valves to undertake the logic.

When the door is opened for the first time, a closing mechanism is loaded, but prevented from closing the door. The door remains free of any closing force and can be left in any position. If anyone tries to slam the door, a valve opens and a second hydraulic circuit implemented with increased resistance.

If, on the other hand, the fire alarm goes off, an electric current causes another valve to open, and the closing force is then released to close the door. Closing speed is limited by fluid passing through a restriction.
www.holdfire.com



Quick and simple on site balancing

SKF has extended its SKF Microlog family of portable data collection systems with the introduction of a new instrument ideally suited for the onsite balancing of rotors. Ideally suited for electrical motor rewinders, the SKF Microlog Field Balancer will support both single or dual plane balancing; and with its easy to follow menus can provide a simple summary report of trial and balancing runs prior to the engineer leaving site.

The innovative SKF Microlog Field Balancer ensures that machinery can operate at optimum performance levels and that operating costs are reduced. Using robust, high-speed data processors, the Field Balancer provides real time display updates of vibration amplitude and phase angle, while calculating the optimum trial/correction weights as required.
www.skf.co.uk

Current probes maximise ease-of-use

GMC-I PROSyS enables a new level of accuracy and ease-of-use with the introduction of its PRO-flex ACP 3000 series of flexible AC current probes. The probes measure AC current from 100 mA to 3 kA, or to 6 kA, depending on the model. Each features three ranges (30/300/3000A or 60/600/6000A) covering almost every light-industrial or industrial measurement application, including power quality and transient currents, machine monitoring and commissioning, and welding.

The PRO-flex ACP 3000 probe head offers a combination of attributes not previously available in a single unit. Measurements are totally non-invasive, requiring no disconnection of primary conductors, or electrical connections to the primary circuit. Rogowski-coil technology is employed, ensuring accuracy, linearity and wide dynamic range measurements. The sensing coil or coils (one per phase in the case of the three-phase model) are flexible, air-cored and lightweight, permitting the user to place them around primary conductors even in the most confined or hard-to-reach locations.
www.i-prosys.com

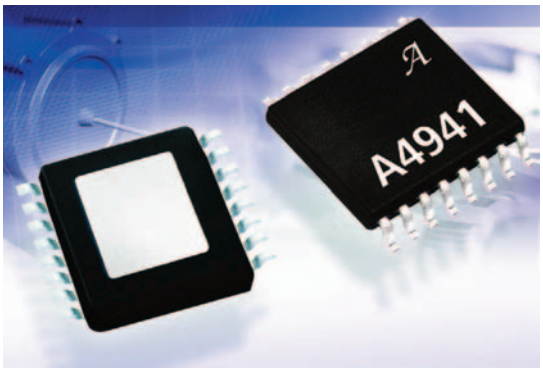
Turning up the heat

NSK has developed a comprehensive package of measures to address the issues associated with operating bearings at high temperatures. All deep groove ball bearings produced by NSK are manufactured using the company's own long life Z Steel material. This is produced by reducing the amount of non-metallic inclusions, oxide and other inclusions in the steel. The benefit is that bearings made from the steel have a significantly extended service life when compared to conventional vacuum degassed steel: up to 1.8 times longer.

To reduce the potential for inner ring creep, NSK offers two grades of heat treated steel which improve the dimensional stability of the bearing when operating at elevated temperatures. X26, for operation up to 150°C, and X28 for applications up to 200°C. NSK has also developed Fluorine and Silicone rubber seals – or metal shields – all of which offer excellent performance up to 200°C.

www.nskeurope.com

Driver IC for fan and blower applications



The A4941 from Allegro MicroSystems Europe is a three-phase, sensorless, brushless DC motor driver IC designed for fan and blower applications in the white goods and office automation sectors. Key features of the new device include sensorless commutation, a wide (5-16 V) supply voltage range, 1.25 A peak output current, -40 to 105°C operating temperature range, lock detection with auto restart, and soft switching for reduced audible noise.

The motor drive system in the A4941 consists of three half-bridge NMOS outputs, back EMF sensing circuitry, adaptive commutation control and a state sequencer. The sequencer determines which output devices are active, while the back EMF sensing circuits and adaptive commutation circuits determine when the state sequencer advances to the next state.

www.allegromicro.com

Single axis motor with coolStep

The TMCM-1180 available from Micromech is an intelligent stepper motor, single axis controller/driver module using the new outstanding coolStep™ technology for sensorless load dependent current control. This allows for the first time an energy efficient operation of an open-loop stepper motor system. With the advanced stallGuard2™ feature the load of the motor can be detected with high resolution.

The module is designed to be mounted directly on an 86mm flange (NEMA34) QMot stepper motor. It converts the motor into a compact mechatronic device with bus oriented or stand-alone control.

www.micromech.co.uk

Engineering tomorrow

Tom Shelley looks at developments in the last 30 years and makes some predictions about the next 30.

The biggest challenges facing engineers are the same today as they were 30 or even 130 years ago: namely, to produce commercially viable products that customers wish to purchase at minimum cost and which involve the least possible wastage of energy.

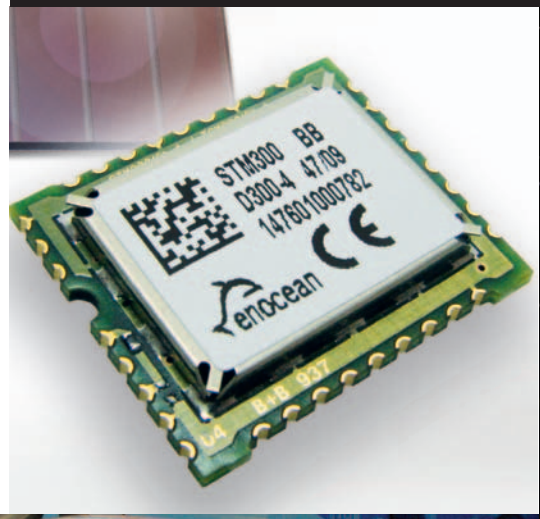
The Cover Story of *Eureka*'s very first edition in December 1980 was about producing three-dimensional woven composites with the goal of saving weight and thus fuel costs in aerospace. Thirty years later, these are commercially available for use as manhole covers and are beginning to be used in aerospace, and there is an enormous amount of research aimed at their wider use. But it has taken a long time to get there.

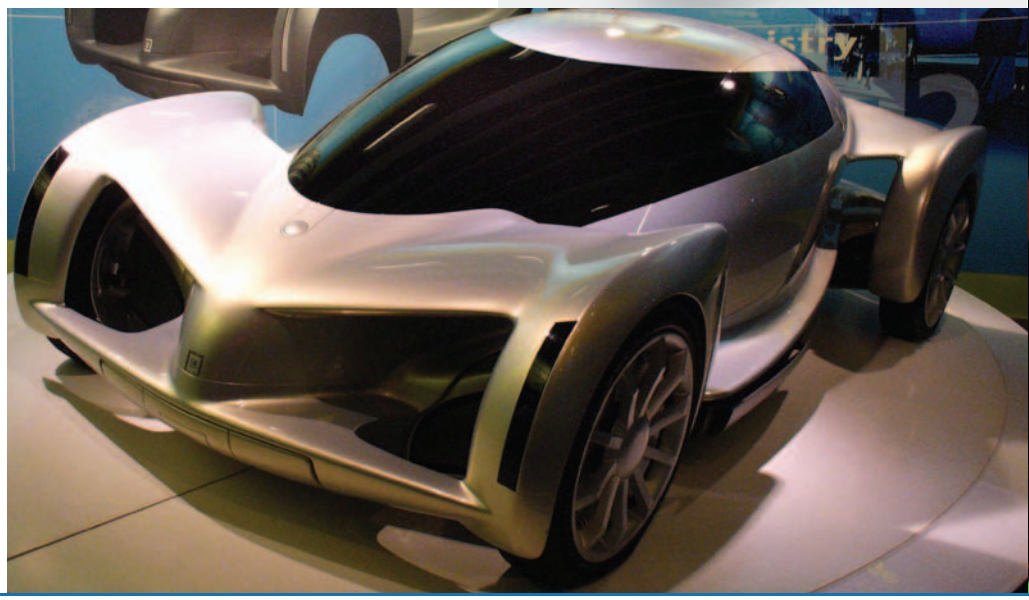
The technique described in the article was based on the use of a 'Tablet loom', originally said to have been developed in ancient Egypt more than 6,000 years ago and there is an argument to say that most things in mechanical engineering have been invented before.

This may be true, but if engineers want to search to see if a suitable idea to solve a design problem has been developed before, they can now make use of something that did not exist 30 years ago – the global Internet and the exploding power of information technology.

For the first time in history, engineers can instantly collaborate, and companies compete regardless of where they are on the planet. And once something is invented, there is no way it can be lost or uninvented. The result is an unprecedented explosion of ideas and developments that makes it possible to for engineers across the world to solve the problems of how to provide enough energy and personal transportation to meet the demands of the world's growing population without wrecking the climate. Hopefully, these developments will not take the 30 years it required to make 3D composite weaving commercial, but if there is one lesson to be learned from study of the innovations reported by *Eureka* over the years, it is the time and the pain that it takes to get real

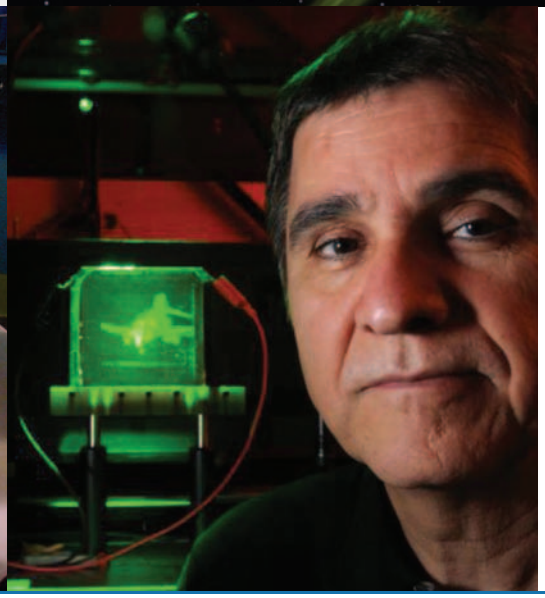
Below: Development in chip technology (such as Enocean's) is profoundly affecting the nature of design.
Bottom: Low carbon vehicles are the subject of radical and competing technological advances.
Bottom right: Ivor Lanzman, with his 3D display technology.





www.eurekamagazine.co.uk

"Until this point, many engineers wrote their own applications using BASIC...Now, 3D CAD modelling and global collaboration are universal"



innovation to market.

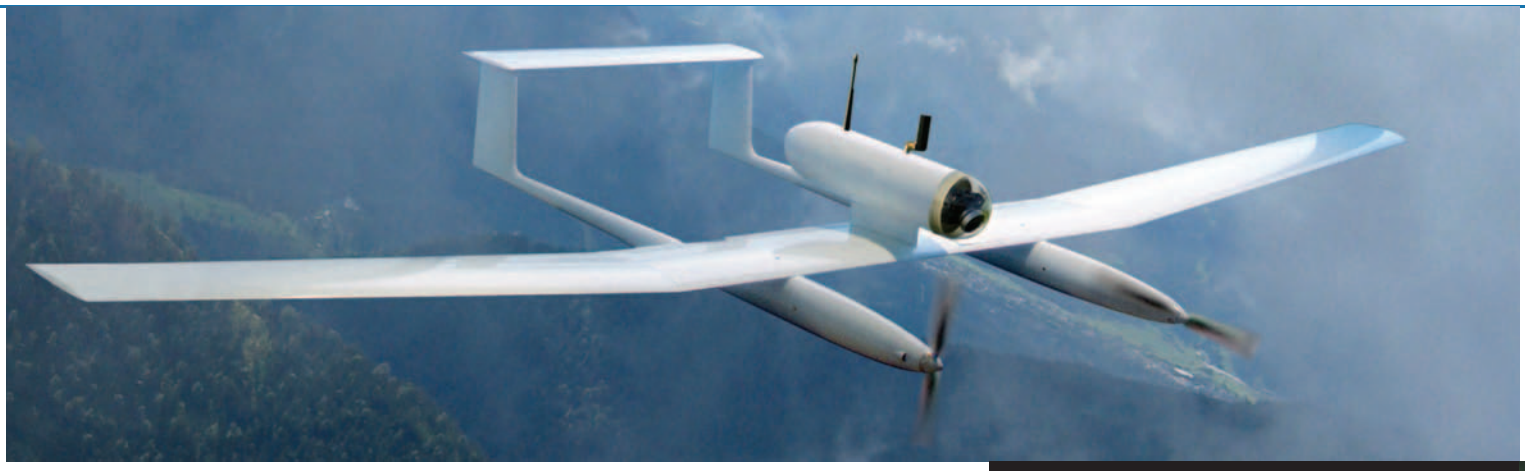
There is no shortage of examples. In December 2003, we published a cover story about the development by Southside Thermal sciences of ultraviolet pulsed laser fluorescence technology for measuring the temperatures of novel ceramic coatings on ground and aircraft jet engine turbine blades so they can safely be run hotter. On October 26th this year, the company announced that it had just successfully conducted a gas turbine engine test on a Rolls Royce Viper 201 engine as part of the project, 'Sensor Coating System SeCSy', which is co-financed through the Technology Strategy Board, in cooperation with RWE npower, Land Instruments and Cranfield University.

Apart from the article in *Eureka*, the company has won various awards, but is still at the stage where it has to say 'STS is looking for potential partners to market this novel coating technology'. Remote measurement capability is up to 1550°C, ±5°C.

In some fields, however, when driven by powerful demand and strong market forces, things can happen somewhat faster. The clearest example of this can be found in the field of computing. CAD in 1980 was crude and unwieldy and most engineers still designed on paper. In December 1980, *Eureka* published 'Software explosion makes tools out of toys'. Until this point, many engineers wrote their own applications using BASIC. Graphical CAD was unknown to most people and a Commodore PET, Apple or Tandy with 16, 32 or 48K of memory plus a printer would set you back £2,000. Collaboration was by personal contact or by mail.

Now, 3D CAD modelling and global collaboration are universal. Elsewhere in this issue, Bernard Charlès, the CEO of Dassault Systèmes, is predicting that we shall all shortly be designing in a truly lifelike virtual reality environment and that 3D printing of prototype parts will in five years time be as common as colour printing is today.

3D CAD and 3D television are already with us, but there are at least three competing technologies that allow users to see 3D images without the need to wear glasses. One involves the creation of holograms – truly 3D images that hang in space. The main barrier until now has been the amount of data that has to be streamed to reproduce the necessary number of hogels – 3D holographic pixels. Another technology that is imminent is parallax barriers – a system of precision slits in front of a 2D display in the Nintendo 3DS, which is to be launched in Japan in February 2011. Finally, there are systems based on microlenses, where an array of lenses forms an array of images, and projecting them back through a similar array reconstructs the image in 3D. According to NPL, which has put much effort into the microlens element, the idea was first proposed by Gabriel Lippman in 1908, who called it 'Integral photography'. Used for years to make 3D greetings cards, we have seen various demonstrations of it in conjunction with LCDs. In addition, a company called Real3D was set up by



Advances in electronic control technology are allowing huge strides forward in unmanned vehicles and have even made it possible for the blind to drive cars (right)

Ivor Lanzman in 2007 to exploit a system that combines microlenses in front of a Fresnel lens array to project 3D advertising images. A convincing demonstration was shown at this year's Venturefest in Oxford.

Electronic control, too, was in its infancy in 1980. Now, anything with an engine is computer controlled to optimise efficiency and performance and silicon chips manage most domestic appliances. The explosion in electronic control can only continue. How long do we have to wait for computers to safely steer and brake our cars as well as manage the engines and braking systems? This hard to say, but the capability is there and the research effort is massive. Even a blind person has been put behind the wheel of a car on a test area in the US (Virginia Tech), although not yet on the public highway. Airline pilots routinely let computers fly their machines, although nobody has yet had the nerve to take them off the flight deck altogether. Meanwhile, robotic unmanned aerial and underwater vehicles are a fact of life with the military. Latest developments, so far only trialled as computer interfaces for the disabled, require users only to look where they want to go, and control by thought is far from impossible.

Clearly, one of the biggest philosophical changes of the last 30 years has been the quantum shift in prominence of environmental concerns. In just three decades, the environment has transformed from a peripheral, minority issue to the driving force underlying much of modern design and research. The need to meet the aspirations of a rising world population, with limited and finite fossil fuel reserves, coupled with a concern not to render the planet uninhabitable has – to say the least – focused minds.

One area that has seen this change more immediately than most has been the automotive sector. After decades of stagnation in design, motor vehicles are transforming rapidly. Hybrid vehicles are commonplace, battery electric vehicles are making a comeback in new forms and millions of motor vehicles with conventional engines in a number of countries have been converted to run on methane from natural gas, rubbish or sewage, or ethanol. Designing a vehicle to run on alternative fuels is said to add around €50, which is much less expensive than a lithium ion battery pack. Fuel consumptions per mile driven for conventional internal combustion engines are vastly better than they were, and are predicted to halve again in the next several years.

The quest for renewable energy has thrown up a range of candidates to meet our future energy needs. Biogas has already been mentioned and the other alternatives are well known: nuclear, nuclear fusion, wind, solar, tidal, wind and wave.

In nuclear, fast breeder cycles that make full use of uranium and thorium cycles are rearing their heads again. Nuclear fusion, on the other hand has not become anywhere near commercial in the last 30 years, and is still not likely to have solved all its technical problems in the next 30 years. Wind energy is turning out to be expensive as well as intermittent but it maybe that the way forward is small scale but with much cheaper devices. This, at least, is the opinion of Matthias Luethi, a finalist in the 2009 British Engineering Excellence Awards, who has set an eventual target manufacturing cost for his 'Silent Wind Turbine' at £100, including generator.

As regards solar photovoltaics, 1980 saw the first cell exceed 10% efficiency and total world production was around 4MW peak. Today, top efficiency is 40%, total world production around 7.3 GWp – 5.6GWp of which was in Europe – and prices continue to fall year on year. However there is a way to go yet. Average total world power consumption is 15TW. The amount of solar energy reaching the surface of earth is around 90PW, where 1PW = 1000TW and 1TW = 1000GW.

Most of this solar energy is, of course, not directly accessible. The UK is at present world leader in wave and tidal energy, which are more accessible, especially round an island. UK Tidal energy may have taken a knock with the decision not to go ahead with the Severn Barrage, but this does not affect projects such as SeaGen's tidal generator in Strangford Lough. Professor John Kemp's OWEL – Offshore Wave Energy Limited, which has waves compressing air as they move along a narrowing chamber in a free floating vessel, is now at the stage of design and construction of a 600 tonne demonstrator.

The search for alternative sources of energy has also taken some unexpected and exciting turns. For instance, humble wireless switches are now on sale that are powered by the user

"Within a few years, mobile communication devices will cease to need mains charged batteries; instead, they will be powered by the heat generated by their users."

actuating them, and the next stage, we are told, is devices that are powered purely by the heat generated by the user.

Based on Siemens technology, but spun out in 2001, the wireless switch technology is now the property of EnOcean, headquartered in Oberhaching, near Munich (the name referring to a perceived ocean of available energy). When the switch is depressed, a magnet is flicked in a coil by an ingenious spring mechanism to induce a pulse of electricity sufficient to send a 125 kbit/s digital 868 or 315 MHz wireless message in the space of 30ms. Each switch comes with a unique

32-bit identification number to prevent overlap with other switches. This does away with the need for wires or passing current through the switches. If this were not enough, EnOceans' Zeljko Angelkoski said at the Energy Solutions show that the company is in the process of commercialising devices that could be powered by temperature differences of only 1 to 2°C. The breakthrough is in DC-DC converters that start operating at 20mV, producing 3.4V. Coupled to a Peltier element, this means that heat from a human hand or body could be made to produce about 1mW, sufficient for a wireless medical monitoring system. A US competitor is Nextreme Thermal Solutions, with its 'eTeg' HV56 thermoelectric. This produces 1.5mW and an open circuit voltage of 0.25V from a temperature difference of 10°C in a footprint of 11mm^2.

Eneco, headquartered in Salt Lake City, spent some years developing thermionic diode semiconductor devices that turn very low grade heat into electric current with somewhat greater efficiencies than is possible with Peltier devices. While the company filed for Chapter II bankruptcy in January 2008, the IP was purchased by some of the shareholders and development has restarted in Texas under the name MicroPower Global. There is also a related MIT based venture called Micron-gap ThermalPhotoVoltaics.

Another approach, described in *Eureka* in January 2007 is 'Power Chips', a Georgian-invented quantum effect technology relying on the difference in the functions of smooth and textured surfaces.

Whoever wins this race, it seems likely that within a few years, mobile communication devices will cease to need mains charged batteries; instead, they will be powered by the heat generated by their users. Furthermore, it is likely that solid state devices will be able to recover energy from low and high grade heat sources.

Materials, too, continue to advance and over, the next 30 years, we can expect even more developments. For instance, the last 30 years has seen nanotubes go from exotic phenomenon to a product that is commercially manufactured in tonnage quantities. The next 30 years is likely to see the same thing happen to graphene nano platelets and also an even more exotic idea: to produce useful human replacement organs from constructions engineered from grown tissue.

Perhaps more than anything, this technology gives some idea of the almost limitless scope for progress. For some time, been realised that growing human spare parts from stem cells is far in the future, so researchers are looking at ways of constructing organs from assemblages of different cells. Here, the UK is taking a lead with expertise in the hands of Professor Mehdi Tavakoli at TWI, in his capacity as programme manager for the Health Technologies KTN; and Paolo Madeddu, professor of Experimental Cardiovascluar Medicine at the University of Bristol and the Cardiff Institute of Tissue Engineering and Repair.

Predictions for the next three decades

Real innovation in the UK will continue to be time consuming and painful

CAD and television will be true 3D without glasses. Before the end of 30 years, design will be conducted in virtual worlds

Cars will, when required, drive themselves. The preferred fuel will be methane derived from biogas, but vehicles will be capable of being run on anything that will burn. Organic rubbish will be a commodity with value

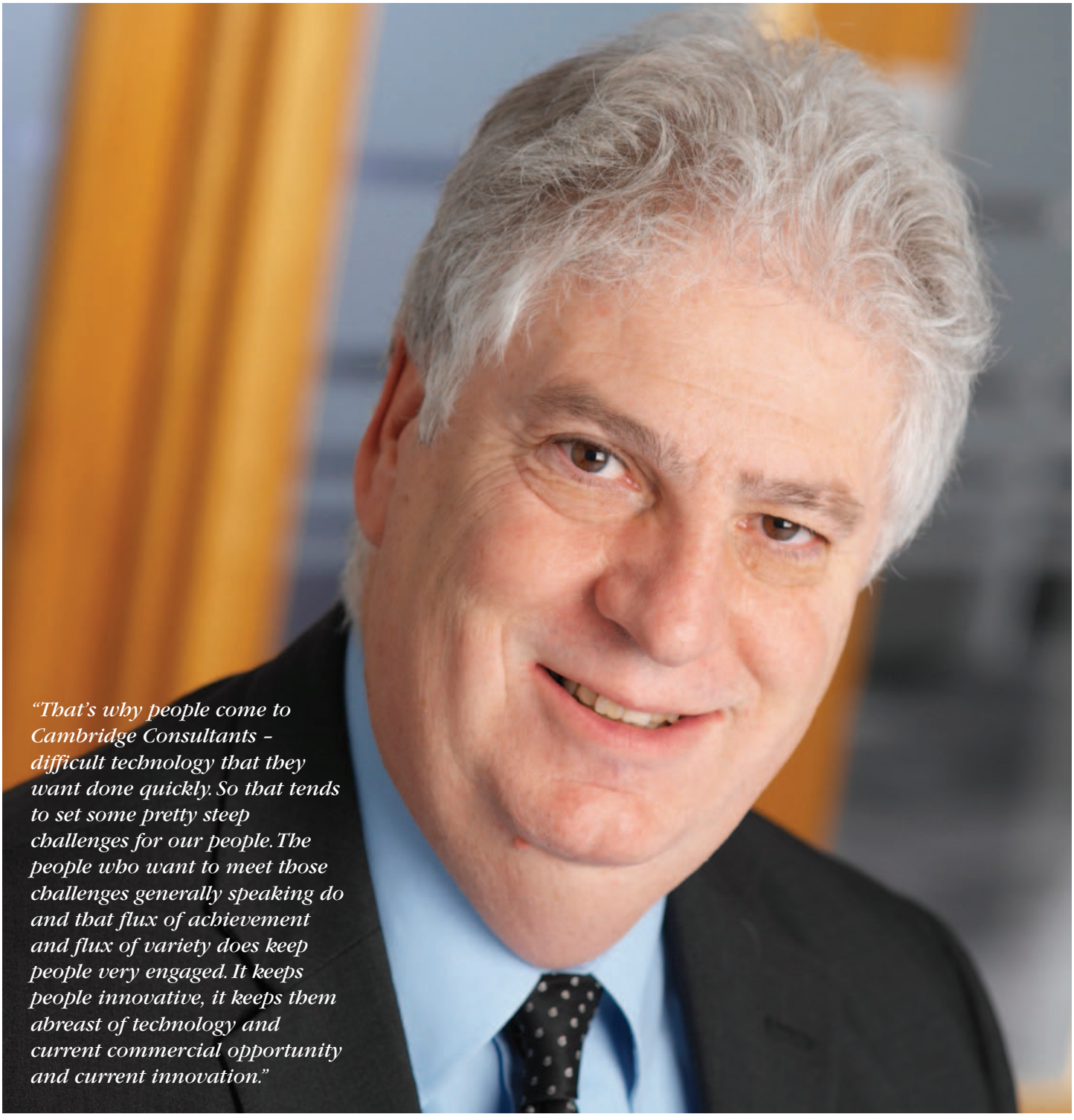
Medical monitoring devices and probably mobile phones will be powered by human body heat. They will no longer need to use any mains power to recharge batteries.

Most of the technical problems to providing world wide 'green' energy will have been solved. Nuclear, low cost small scale wind and photovoltaics, tidal and wave power will all play their part. Low grade and high grade heat will be increasingly directly converted to electric power by solid state devices. It seems likely that fusion power will still remain a goal that lies 30 years in the future.

The miracle engineering materials will be based on graphene. Carbon nanotube based materials will have become commonplace.

Replacement human organs will be constructed by engineers from biologically grown parts

www.stscience.com
www.enocean.com
www.nextreme.com
www.micropower-global.com
www.mtpvcorp.com
www.powerchips.gi
www.silentwindturbine.com
www.seageneration.co.uk
www.owel.co.uk
www.cardiff.ac.uk/citer



"That's why people come to Cambridge Consultants – difficult technology that they want done quickly. So that tends to set some pretty steep challenges for our people. The people who want to meet those challenges generally speaking do and that flux of achievement and flux of variety does keep people very engaged. It keeps people innovative, it keeps them abreast of technology and current commercial opportunity and current innovation."

ww.cambridge-consultants.com

"In the early days of Cambridge Consultants, "I think there was a lot of technology panache and a desire to do something new and valuable for UK industry … the company did a lot of interesting things."

Innovating for a living

For 50 years, Cambridge Consultants has remained at the cutting edge of technological development. Paul Fanning asks CEO Dr Brian Moon how this has been done.

"Simple is always difficult," says Brian Moon, CEO of Cambridge Consultants. His words could, of course, serve as an effective mantra for all those involved in product development, but it is a lesson that Cambridge Consultants has learned over five decades' experience in cutting edge technological innovation.

Like *Eureka*, Cambridge Consultants is celebrating an anniversary in 2010, although in its case it has 50 years, rather than 30, under its belt. Dr Moon describes the history of the company as having existed in three separate phases. The first began in 1960 as a means of putting Cambridge University's best minds at the disposal of British Industry (in particular the defence sector). Following the acquisition of the business in 1972 by Arthur D Little, however, there was a greater emphasis on internationalisation and diversification, something that has continued following the company's 2001 acquisition by Altran.

"In the early days of Cambridge Consultants," says Dr Moon, "I think there was a lot of technology panache and a desire to do something new and valuable for UK industry … the company did a lot of interesting things." While the emphasis for the company has shifted over the years into new markets and business models, Dr Moon believes that certain guiding principles remain solid. "Throughout its life, Cambridge Consultants has been populated by technically able people who are mostly spending their time working to meet client objectives on projects that clients define for us. We have a hand in how we go about those projects and how we achieve those objectives, but the objectives themselves are client defined. But for some of them, their creativity doesn't stop when they go home or during the time when they're not working on specific projects."

Clearly, the variety of projects in which Cambridge Consultants is involved is another factor that helps to ensure that a spirit of creativity is maintained in the company. Says Dr Moon: "One of the things that keeps our people fulfilled is the variety of work that they get to work on. We have 200 clients a year… There's a flux of projects and they tend to be very demanding technically and in terms of times. What our clients are typically asking us to do is difficult things fast. That's why people come to Cambridge Consultants – difficult technology that they want done quickly. So that tends to set some pretty steep challenges for our people. The people who want to meet those challenges generally speaking do and that flux of achievement and flux of variety does keep people very engaged. It keeps people innovative, it keeps them abreast of technology and current commercial opportunity and current innovation."

However, while employing such technically-gifted people and constantly challenging them is key to ensuring innovation, clearly there is far more to it than that. "It's not the case that we just sit back and watch this ferment happen. You have to marshal it, you have to direct people," says Dr Moon. "One of the things that makes Cambridge Consultants the business it is are our processes: the way we do project management and the way we manage our quality assurance. The heritage over 50 years is that we have developed processes for managing ourselves and managing projects and aspirations and achieving our objectives. We've got a whole lot of processes that we believe in because we've seen them work over years and we are very determined on them."

Certainly, these principles and processes appear to work. Not only does the company's client list speak for itself, but so does its record of creating spin-out businesses. Says Dr Moon: "Cambridge Consultants has an exemplary record of creating spin-outs. I could mention [inkjet printing companies] Domino and Xaar, as well as CSR – public companies that between them employ thousands of people and create huge amounts of money and wealth. That's quite an achievement." This tradition is maintained by the company's Corporate Development Projects, which use a fund of £10million, established with venture capital company Esprit, to invest in ideas that people create and bring them to a point of demonstration. This is done with the intention of creating two more spin-out companies over the next five years.

Looking to the future, Dr Moon sees Cambridge Consultants continuing to perform the role it does today. One technology trend he identifies is in technology transfer between, for instance, communications and medical technology. In this respect, he feels, the company is uniquely placed to offer solutions. "The sort of things that are happening right now are about the coalescence of technologies," he says. "I think Cambridge Consultants has always been good at technology transfer. We've been in a privileged place where we've worked in a lot of areas and we've frequently seen exploitations for those self-same technologies and techniques in other areas. I think we have has always been very good at working in techno-commercial gaps."

Where have all the engineers gone?

In this article, contributed for *Eureka*'s 30th Anniversary, Richard Noble, Director of the Bloodhound Project, asks what must be done to encourage the next generation of engineers.

January 2005: Holder of the World Land Speed Record Andy Green and I are up before Lord Drayson, MoD Minister of Defence Equipment and Support. The Americans are threatening our ThrustSSC supersonic land speed record with a new challenge and there is just time in our lives to do one more highly innovative supersonic car. It's going to be the greatest ever and it's called Bloodhound SSC. Our meeting with Lord Drayson is crucial – we need an EJ200 Eurofighter engine, the most advanced military engine anywhere and the Minister, if asked nicely, might just oblige.

Of course, it went wrong. The friendly meeting with the Minister remained friendly, but there was no instant gratification, just a polite switch of conversation which suggested that the meeting was drawing to a close. And then Lord Drayson said something which changed all our lives – for ever.

"You can help us."

He went on to explain that the MOD's biggest problem, apart from money, was its inability to recruit engineers . He had thought about it long and hard and had come to the conclusion that we needed to revisit the 1960s – a time when the country had an incredible aerospace industry creating highly innovative prototypes like Vulcan , TSR2, Lightning and Concorde. This was a time when all schoolkids were obsessed with new technology and many wanted to be test pilots or engineers. This resulted in a generation or two that provided a steady supply of engineers. But now something had changed and the MOD was struggling.

He said: "I want you to create an iconic project and run it through all the schools to encourage a new generation of engineers." I immediately accepted and that put us all in deep trouble.

The first thing to do was to find out what we could. The Lord Leitch Report of 2005 had raised the original concerns. The failure of companies to run traditional apprentice schemes in the last Century meant that skills now resided in the 40 to 60 years age group and there was little to replace them in the 25 to 40 range. This hit home dramatically with the skill-dependent aerospace industry, which woke up late to the fact that 60% of its skilled workforce would be gone in 20 years.

But the problem went a lot deeper than just the apprentices. We heard stories of teachers telling their classes that engineering was an underpaid, dirty business which had now been passed on to the Chinese and Indians and that today's schoolchildren should head for the media or law. If the career decision was taken to be an engineer, then you could always opt out after graduation and pursue a career in Financial Services . One well known banker was enthusiastic, saying: "We welcome engineers: they are highly-disciplined, highly numerate and great problem solvers."

It seemed too that engineers hadn't really helped themselves – their image was poor and there seemed to be an over emphasis on great engineers of the past. Most people would have great difficulty in naming a famous living engineer. It was as if the Engineers had totally ignored the huge growth of the media industry – engineers didn't feature in soaps, there was no engineering equivalent of The Archers or Farming Today. It was as if the engineers, the great innovators, failed to realise that they needed to promote themselves or face complete loss of identity, or even extinction.

I had noticed this when we did the ThrustSSC project and were the first to break the sound

"I want you to create an iconic project and run it through all the schools to encourage a new generation of engineers."

barrier on land. Our business was to create media exposure, convert that into finance via sponsorships and build our 100,000thp car. We had carried out extensive research, created a safe design solution and progressed into the car build. At that most exciting point, the media coverage dried. I panicked and went to see editors and journalists. They explained that their readers would never understand the technology involved in the build and it would be better if they let us get on with the high technology bit without coverage until, of course, the car started its run programme – then they would promise to be there to cover the noise, flame, violence and so on.

The BBC man was more forthcoming; it seemed there was an unwritten rule in the BBC that the mental age of the audience is 10. It was therefore important not to include even simple technology because audience share would be lost. So the BBC would give us 'Tomorrow's World' features, but that would be all. Our only hope lay with the then emerging internet and we built a 800 page website. With the website we were able to log the pages read by the followers.

And what did they read in huge volumes? – the technical pages!

The ThrustSSC website, developed by Jeremy Davey, was one of the largest in the world at that time, running 59 million visits/300 million pages in 1997 – making it 30 times the size of a top ranking Formula 1 team today.

We had it right for once. We learned that the public love innovation and they love engineering. Today's media is still locked in the old time warp and a huge opportunity is being missed. Make a point of looking at today's BBC programmes and note the emphasis on primitive vocal contests and cooking – all simple material. Even Top Gear is dumbed down to focus on mockery and destruction – again simple, low-risk material.

Bloodhound is there to break the mould and help make the change. The website runs 160,000 pages a month to 203 countries and we don't yet have the car. Sales and donations run at £240,000/a year – this doesn't exactly typify a minority site.

I remember a hugely embarrassing episode: The ThrustSSC project concluded with a huge global success – Andy Green was given an OBE, but the engineers were not recognised for an incredible national achievement carried out in very difficult circumstances. Later, I found myself with the President of the Board of Trade and offered the project as a global trade and education promotion. She responded: "Do we have to?" I said "No" and left the room as quickly as I could.

In retrospect, the whole episode was completely understandable – the Government was more interested in deregulating the City and promoting the post industrial society. This year, the Governor of the Bank of England apologised to the TUC and admitted responsibility for the City failures.

Bloodhound attends some 100 exhibitions a year and we meet tens of thousands of people. There is a huge demand for the return of engineering and innovation.

Perhaps that's the reason why Bloodhound education has been taken on by 4,000 UK schools, colleges and universities.

Perhaps we are seeing a huge resurgence in the popularity of engineering and innovation? Perhaps this time, engineers will start promoting themselves their innovation, their skills and their learning? Perhaps this time, the media will learn something!

www.bloodhoundssc.com
www.thrustssc.com

"Prediction is very difficult – especially of the future."

Expect the unexpected

Kate Bellingham, National STEM Careers Coordinator, engineer and former 'Tomorrow's World' presenter stresses the difficulty of predicting future technology.

In a speech 20 years ago, I confidently attributed these words to Niels Bohr, the physicist. It came from a book. Now, after a quick internet search, I find there are several variations of, and attributions for, this quotation – just one of the consequences of our 'information' age. However, I personally hope it was Niels Bohr who said it, because it gives those words a subtle subtext of quantum physics, rather than being a glib comment on, say, playing the lottery.

My interest in technology futurology started when I joined the presenting team for the BBC programme 'Tomorrow's World' in 1990. Despite the title, I didn't see it as predicting the future – a TV Tardis to travel in time and glimpse our destiny. What I tried to do was give a sense of technical and technological possibility. What happens after that depends on many factors, including the audience themselves.

So looking back over those 20 years, is there anything we can learn from our expectations of 'Tomorrow's World'? Perhaps the strongest message is to expect the unexpected.

I remember a feature on domestic audio equipment. At the time, we had recordable cassette tapes and play-only CDs. What would be the 'next generation'? I demonstrated the DCC (Digital Compact Cassette) and the Minidisc, and talked about how DAT (Digital Audio Tape) was having such an impact in the professional audio market. We now know that what we were waiting for was not a 'thing' that you put into a 'player', but a completely new audio format and a new way of using it – the MP3 player.

I demonstrated the first commercially available domestic videophone. Now, how many of us have got one of those sitting on the telephone table in the hall? Instead we share pictures and videos via our mobile phones. Which brings us to another 'left field' development – the mobile being used for texting. Who would have thought that given the chance to talk, or to leave a voice message, people would choose to tap a tiny keyboard instead? According to US data published in October 2010, voice usage by teenagers is down by 14% in just one year, while other forms of mobile communication continue to increase.

While 'Tomorrow's World' became a national institution, and whether your memories are of Raymond Baxter, Judith Hann, Bob Symes or Philippa Forrester, there are other places to look for how well we predicted the technological landscape in which we find ourselves.

Tempting as it is to revel in the success or failure of 'Star Trek' and 'Back to the Future' as predictors, I will instead guide you towards the commercial attempts in the early 1990s, which could be far more enlightening.

Ian Pearson has been working in the futurology business for nearly 20 years. This is a very different role from a crystal-ball-gazing fortune teller, and insight and inside knowledge give helpful pointers at least, and real commercial benefits at best. A look back at his 'future calendar' from 1995 shows how our mindset has changed. The calendar suggests that, by 2000, we would have widespread use of home health diagnostics and daily check-ups on line. And, by 2010, we would be using large, wall hung high definition displays and interacting with computers at home using natural language – like talking to a real person. Overall, many things on the calendar have come about, though perhaps not in the way they were described, while others have fallen by the wayside.

What we can learn from this calendar is that you cannot rely on what is likely to be technically possible, you need to include financial and social imperatives and barriers.

Also in 1995, the UK Technology Foresight programme published the results of its Delphi Survey – a wide consultation of the business and the science and technology communities on more than 1000 topics, looking at opportunities for wealth creation, improving quality of life and a realistic timescale. But it also sought views on anticipated barriers, such as lack of funding, regulation and standards, social and ethical acceptability and education or skill base.

It makes fascinating reading and the overriding feeling is that, however much you look to the future, the ground shifting under your feet can make the most difference. While there is mention of sustainability and environmental impact, this is not portrayed as an embedded, underlying feature as it is today. And while we certainly knew that communications technology was going to be different, we did not have a clear picture of the impact, particularly of mobile technology and the 'app' world we now live in.

It will not surprise you that I am wary of making any predictions at all, but I will tentatively suggest that we will move even further away from technology for technology's sake. It is not having the latest gizmo that counts – it is what it does that matters.

I'm also intrigued by the influence of the internet. I am involved in a crowdsourcing project looking at reusing existing technology for environmental benefit (www.openplanet ideas.com). Social networking, cloud computing and the myriad of new communication opportunities are redefining collaboration, not just in business, but in broader society.

And, finally, how will we ascribe value to products, processes or ideas? If something which was sold a decade ago is now freely available, where are the income streams of the future?

A positive note on which to end is that there seems to be an increasing opportunity to influence the direction of technology. The future isn't just something that will happen to us – we can play our part in making our future.

Having said that, here we are in 2010, spending our Saturday evenings watching ballroom dancing and talent shows. As I said, expect the unexpected.

www.katebellingham.com

CAD and PLM – The next 30 years

Tom Shelley gets a horse's mouth insight into the shape of CAD and PLM in the years to come.

Bernard Charlès, CEO of Dassault Systèmes forsees a dramatic increase in 3D virtual reality in CAD, education and every day living, with 3D printing of products and many other major developments likely in the next ten years, let alone the next 30 years.

Looking back over how far CAD has come in the last 30 years, he expresses the opinion to us that presently, we are still in the "Stone age", compared to where we will be in years to come.

From crude beginnings in 1980 – Matra Datavision was founded that year and Dassault Systèmes the year following – he asks: "What were the things that made it possible to design a completely virtual aeroplane that would take off or a car that would crash exactly the way it had been modelled ?"

"What has been achieved", he explains is the

"All education and scientific research will use virtual worlds. Learning by experience is the most powerful way for humanity. We are now just at the beginning."

"The contribution of 3D to society is going to be very profound."

"Capability to represent, simulate and predict what will happen in real life." He predicted that this process will now continue further, with, "Not only the capacity to see" what can be expected to happen but, "The capacity to live in and go inside" a representation of a virtual world that will be so realistic that, "You will not be sure if it is a dream." He argued that this will be necessary in order to ensure better product design by achieving a "Fusion between virtual and real world, in which the product will be used."

His game plan in engineering, he summarised as: "Develop new collaborative platforms, using the power of 3D and print the product." He was of the opinion that within five years, 3D printing would be as routine as colour 2D printing is now.

When asked what route he thought the 3D experience would take, he replies that this might be achieved by wearing glasses, but the interface through which the virtual world would be experienced and worked in would not be a screen but "Just a thin piece of glass". "Why is the display on a desk? Why is it not wherever you are looking? 3D television is already with us. In future, this will change so much." He also argued that designers should begin their design in a realistic environment, to help them think about how products are going to be manufactured and assembled, as well as used, right from the beginning. He said that he asks: "Why are objects being designed floating in the air. If they are going to be made and used, they are going to be sitting on a chassis or on the ground." He argues that design should be in a "Lifelike experience" as regards both using and making the product, and that "Product Lifecycle Management" is going to progress to "Product in Life", and that designers will greatly benefit from trying to use their virtual products in a realistic virtual environment before finalising their designs.

He specifically mentions the Infinite Z technology, where designers wearing glasses interact with models that appear to hang in front of them using a special stylus, as one example of the route the company might follow, and also the Tobii eye tracking technology, where users direct by looking, instead of using a mouse.

However, he clearly sees his company's 3D technology as being something that has wider application than just in the engineering design office. "All education and scientific research will use virtual worlds. Learning by experience is the most powerful way for humanity. This process will accelerate," he expanded. He suggested that great advances in merging real and virtual worlds are already being made in the film, television and games industries, and much of this is likely to ripple through into engineering design and manufacturing and research and education.

In all areas, he argues that, "Contribution of 3D to society is going to be very profound." The company is already making advances into the biotechnology and consumer arenas, where it expects its 3D businesses to grow substantially.

In biotech, Dassault Systèmes is coordinating the European Union 'BioIntelligence' research and development programme, which is receiving a grant of €46.3 million from the French government. The immediate aim is to promote the use of systemic modelling and simulation tools to exploit biomedical databases based on the PLM used by manufacturing, to enable life science industries to optimise research phases.

3D simulation is already being used in the design of drug molecules and studies of molecular processes in the human body, and the wheel comes full circle with the latest developments in tissue engineering, to create replacement living organs, using engineering methods. This arises because of the limitations of purely mechanical prosthetics and the way that growing new organs all the way from stem cells looks to be far in the future. Harvard Medical School, M. Charlès, said, is making extensive use of the Dassault Systèmes product, Simulia, for simulating human skeletal interactions with a view to developing innovative treatments for ailing bones. For this, Harvard researchers have teamed up with engineers from Foster-Miller, part of QinetiQ North America.

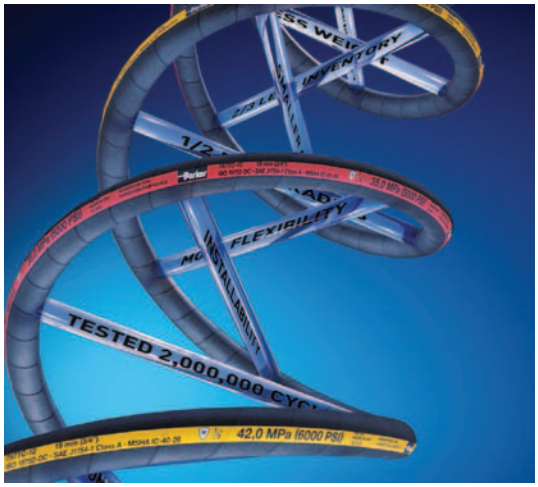
In the consumer arena, as we have long predicted in ***Eureka***, M. Charlès believes that customers who wish to buy products using the Internet will increasingly demand a virtual experience before they purchase. This is likely to particularly apply to clothes, where potential purchasers can expect to be scanned in a booth or at home and then be able to see how garments will look on them as they move. However, the same capability also is likely to be demanded by customers seeking to buy almost any products, and the simulations will depend on the 3D and functional data produced during the design process.

M. Charlès said that investigative police in France already make use of Dassault Systèmes Virtools in an application called 'SiVIC' – Simulateur Virtuel d'Investigation Criminelle - to train officers in crime scene investigation. The simulation is projected onto the walls of a virtual reality cube and other rescue and safety scenarios.

As M. Charlès sums up, "We are now just at the beginning."

Building a winning strategy

Nick Wright, Vice President Business Development & Marketing Europe, Middle East and Africa, looks at how Parker's Winovation strategy underpins success and provides the foundation for long-term growth.



There's an old adage that tough times require tough measures; and, arguably, the last two years have been among the toughest ever for economies and businesses around the world, where we have seen cost cutting, bail outs, restructuring, redeployment and a host of alternative strategies to ensure survival and underpin future growth.

Yet for companies such as Parker Hannifin, the downturn in the global economy has been a period of quiet but solid consolidation and growth in key markets, creating robust foundations on which to build as the western economies recover and as emerging markets return to pre-recession levels of demand.

For Parker, growth and success are driven by a clear long term strategy, based on rigorous management processes, solid investment policies and an ongoing, company-wide commitment to innovation. This core philosophy of innovation has sustained and directed Parker since its foundation in 1918, and has been instrumental in helping us achieve our position as the world's leading diversified manufacturer of motion and control technologies. Perhaps as importantly, this philosophy enables us to deliver outstanding products and customer services and, increasingly, underpins our goal of partnering with customers to resolve many of the fundamental issues facing society; for example, the need to conserve critical energy and water supplies, to reduce pollution, and maximise crop yields in developing nations.

Our market-leading position is also based on a process of organic growth and strategic acquisition, enabling us to create an extensive portfolio of products that meet the needs of our customers throughout industry. In the last 30 years, for example, we have acquired some of the most respected brand names in industry, including Alenco, Racor, Schrader Bellows, Digiplan, Telepneumatique, Chomerics, Polyflex, VOAC, Maxam, Fairey Arlon, Dennison, Vansco, domnick hunter, Legris and Origa. Each has been integrated seamlessly within the existing Parker organisation, bringing new strengths and capabilities and helping us deliver even greater customer value.

As a result, we now offer a comprehensive choice of motion and control technologies, including hydraulics, pneumatics, filtration, fluid controls, drives, electromechanical, seals and instrumentation. On its own, however, the ability to offer an extensive choice of products does not necessarily build a successful company.

Winovation

Instead, success derives from many different factors, of which one of our principal differentiators is the unique Winovation strategy. With multiple divisions, some 300 manufacturing locations, a network of sales and customer support centres and 55,000 employees in 46 countries, Winovation allows us to create a common, business-wide framework within which a process of constant innovation – both in products and processes – can be delivered. In addition, the Winovation strategy provides a set of tools that focus and guide individuals as well as teams, creating the ability to develop new ideas and, as importantly, to disseminate these in a controlled and beneficial manner.

In essence, Winovation is a strategic business methodology that allows us to focus on important projects that deliver the greatest potential value. By taking research and development out of the engineering workshop, and transforming it into a rigorous, structured and flexible business process we're able to capitalise on the inspiration, imagination and expertise of our employees

www.parker.com

"No longer are we a company selling products; instead, we're partnering with customers to deliver technologies that help them improve the performance, functionality, productivity and profitability of their production processes or manufacturing operations."

worldwide and channel this energy in new and exciting directions.

This has resulted in major changes in the way we carry out our business processes. For example, managers are increasingly engaged in the actual process of discovery and invention, giving us greater leadership with a management style that is flexible and less constrained by traditional attitudes or disciplines; in effect, Winovation has made us far more entrepreneurial, which is almost unheard of for a $10 billion sized organisation.

In addition, our design engineers now have to apply a commercial value to each innovation or product evolution by describing its importance to the end-user or customer; making something smaller or faster is no longer sufficient, instead the key is to show how product features translate to tangible customer benefit. This has had a significant impact on many aspects of product development, ranging from a transition in the way we value products, which now involves closer collaboration with our customers, to the fact that our engineers are spending far more time with customers.

Parker's solutions take in elements as diverse as its involvement in the Bloodhound Project (top), the supply of compact spiral hose and its SEMS energy management system for refuse trucks

In practice, this had led to a steady change in business emphasis. No longer are we a company selling products; instead, we're partnering with customers to deliver technologies that help them improve the performance, functionality, productivity and profitability of their processes or manufacturing operations.

Delivering value

Our Winovation strategy is one of the key factors that differentiates Parker from its competitors and, in conjunction with our conventional management disciplines, is playing a vital role in helping us maintain our market position, even during challenging economic periods. In recent years it has enabled us to bring to market a steady flow of new and improved products, to enhance the efficiency of many of our business and production processes, and to refine and focus our customer services, such as ParkerStore and Hose Doctor.

For example, the Winovation strategy has led to a number of major breakthroughs in technology, including the development of a fuel tank inerting system for aircraft, for reducing the risk of explosion from fuel vapours; in turn, this system was based on a unique Parker gas separation technology, which produces a flow of high purity nitrogen from a conventional compressed air supply. Other projects include Close-Coupled Instrument Mounting Systems that reduce installation time, improve safety and cut costs in the petrochemical industry, simple clamp mechanisms for underwater use that prevent galvanic corrosion, and Compact Spiral hydraulic hose that is lighter, tougher and more flexible.

The Winovation strategy is not, however, reserved only for high profile projects. Indeed, by creating a culture of innovation it is regularly used to aid the evolution of existing and often standard Parker products and systems to extend their functionality and performance in many different applications. This can range from the development of smaller and lighter pneumatic valves, that are capable of being used in extreme conditions, to compact hydraulic pumps and motors, and low cost in-line particle and moisture detection systems for hydraulic oils and fluids.

Supporting Innovation

Parker has been supporting innovation for over 90 years. From the fitting of high-pressure hydraulic connectors to the Spirit of St. Louis aircraft, for the first solo Atlantic crossing by Charles Lindbergh in 1927, to our ongoing involvement in the pioneering Bloodhound 1,000mph landspeed record attempt in 2012, we've always been, and will remain, at the forefront of motion and control technology.

Parker was involved in the fitting of high-pressure hydraulic connectors to The Spirit of St Louis

Looking to the future, our ongoing Winovation strategy will play a crucial role as we work with customers to address many of the challenges facing our rapidly evolving society, at both a local and global level. In particular, we'll be focussing on issues such as carbon reduction and energy conservation, building on our existing product platforms and developing technologies to create solutions that meet the technical and commercial demands of the markets in which we operate.

Central to this process will be our continued ability to deliver solutions that address environmental, social and business needs, without discernable impact on the operating performance or efficiency of machines or equipment. We are, for example, already beginning to achieve this with commercial vehicle systems that reduce emissions and noise, while simultaneously improving fuel consumption, engine efficiency and long term operating life.

Balancing the needs of our business, staff and customers, with our environmental and social responsibilities will be key to the long term success of Parker as a global organisation. With our long history of innovation, partnership and value, we believe that we have the strategies and philosophy required for success, today, tomorrow and far into the future.

Precision in the Extreme

Zettlex position sensors offer unrivalled accuracy even in tough environments and tight spaces

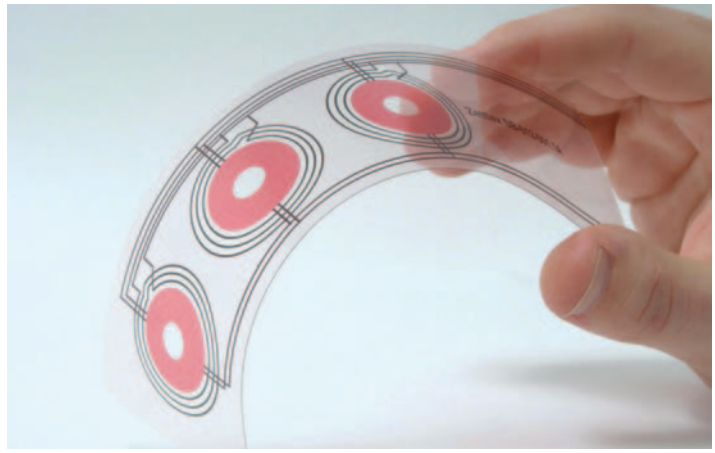
2004 - Zettlex founded
2005 - Zettlex on Eureka front cover
2007 - Sales exceed £1M
2008 - Company expansion & relocation
2009 - First aerospace products in service
2010 - Zettlex launch IncOder range

Zettlex is a sensors company. The company's motto is 'Precision in the Extreme' – reflecting the company's work in accurate position and velocity sensors for harsh environments.

Zettlex use a unique, patented inductive technique. Whereas traditional inductive sensors, such as resolvers or linear transformers, use bulky wire spools or coils, Zettlex sensors use laminar, printed circuits as their main components. The result is a non-contact, compact, lightweight and accurate technique that lends itself to servo controls, motor encoders, metering and displacement measurement.

Zettlex sensors are used for linear, curvi-linear, circular, annular, 2D and even 3D geometries – measuring up to 6 axes of displacement from one sensor. Because the technique uses printing rather than precision coil winding, the sensors can be readily designed to suit customer applications where mainstream sensors are too big, heavy, fragile or inaccurate.

A key feature of Zettlex's technology is its stability. Even with some of Zettlex's rotary encoders offering up to16 million counts per rev, the technique has absolutely zero hysteresis. This means a Zettlex sensor will read consistently, irrespective of humidity, temperature, vibration, life-time, dirt or liquids.



Zettlex are not exaggerating when they talk about extreme environments. Its sensors have successfully operated in temperatures of 230 Celisus, -55 Celsius, aggressive acids, explosive gases, long term salt water immersion, 1000g shocks and pressures from vacuum to 1000bar.

Whereas magnetic or optical sensors might require Swiss watch precision alignment or installation to achieve their stated performance, Zettlex sensors can be installed by 'any idiot with a screwdriver'. The technique is inherently insensitive to displacements in axes other than the measurement axis. This means that equipment manufacturers need not worry about, or suffer cost penalties from, tightly toleranced housings, mechanical supports or precision bearings. Similarly, Zettlex sensors are unaffected by dirt or moisture so there is no need for seals and gaskets.

Areas of particular relevance are safety critical sensors, intrinsically safe sensors and larger diameter (but flat) motor encoders. Safety critical systems usually require some form of electrical redundancy and this is readily achieved using Zettlex's printed circuit approach. Sensors can be formed on the same laminar components but simply located on different print layers. Similarly, because Zettlex sensors are readily potted or encapsulated, the achievement of a 'no-spark' design is straightforward and inexpensive. The technology's flat, laminar form has been an important factor in the company's success in through shaft motor encoders where axial space is tightly constrained.

After developing lots of bespoke, large bore angle encoders for OEMs, Zettlex launched its IncOder range earlier in 2010. IncOders offer a lower cost but robust alternative to ring style optical encoders and pancake resolvers. IncOder has been a big hit with manufacturers of gimbals, test machinery, machine tools, camera mounts, medical equipment and gunnery systems. A recent design win for a weapons system was a 'slam dunk' against a competing pancake resolver - IncOder offered better accuracy, 90% weight saving, 70% space saving and a 60% cost saving.

Zettlex is particularly proud that its products are on active service helping UK and US forces with their reconnaissance and surveillance actions in harsh conditions on land, sea and air.

Zettlex is an independent, private company based in Cambridge with a European Office in Slovakia. The company is certified to ISO9001 and BS EN 13980 for the manufacture of ATEX rated products. A small range of standard sensors is available from their web-site but 90% of production is either tailored or bespoke designs to OEM specifications. Despite the economic climate, the company is growing quickly based on a long list of design wins in defence, aerospace, industrial, oil & gas sectors.

Zettlex Ltd. Newton Court, Newton, Cambridge, CB22 7PE Contact: Mark Howard info@zettlex.com T: 01223 874444

www.zettlex.com

Zettlex

Precision in the Extreme

Inductive angle encoders that tick all the boxes

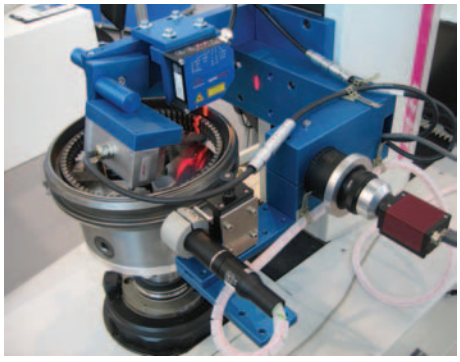
- ☑ accurate
- ☑ absolute
- ☑ robust
- ☑ large bore
- ☑ compact
- ☑ lightweight
- ☑ economical

Available online at www.zettlex.com

MICRO-EPSILON

Innovative, next-generation, non-contact displacement sensors

There seems to be no end to the continuing drive towards the miniaturisation of displacement measurement sensors, particularly with regard to integrated electronics and to smarter sensors that offer an abundance of features and increased functionality, says Chris Jones, Managing Director at Micro-Epsilon UK.



100% inspection using multiple Micro-Epsilon optical sensors

Displacement can be measured in various ways by using a number of different physical measuring principles. Some years ago, displacement sensors were still relatively large in their housing design, with separate, discrete electronics. However, new technologies and production systems are now enabling miniature sensors to be produced with integrated electronics. A pioneer in this field is Micro-Epsilon.

Established in Hanover, Germany in 1968, Micro-Epsilon was originally a manufacturer of strain gauges, the start of the company's displacement measurement product range.

In the mid-1970s, it was already recognised that the future for Micro-Epsilon was in non-contact displacement measurement technology. In contrast to contacting systems, non-contact sensors operate wear-free and so provide more reliable results over longer periods. Modern production systems require minimal cycle times and so require very rapid acquisition times from displacement sensors, which in turn can only be guaranteed by utilising non-contact measurement techniques.

In the case of sensitive objects that are adversely affected by contact, non-contact sensors are ideal as they measure the distance to the object from a safe range. The requirements for the performance and reliability of the displacement sensors are very high. Important application criteria are measurement frequency, accuracy, temperature stability and resolution.

Extensive displacement measurement technology

Since the start of its own development efforts, Micro-Epsilon has attempted to establish as comprehensive a portfolio as possible in the field of displacement measurement. In the non-contact displacement measurement area, the company's range today includes the traditional electromagnetic methods: capacitive, inductive and eddy current. Laser triangulation, time-of-flight and confocal sensors are provided for optical displacement measurement. This means customers always obtain an optimum solution for their measurement task, since a narrow product portfolio does not restrict their choice.

Current trends in displacement measurement technology indicate that smaller, more intelligent sensors with integrated electronics are now required. In mechanical engineering, the requirement for extremely compact sensors is always an important factor, especially if installation space is restricted or if the sensor needs to be lightweight. This is also the case in terms of integration of more electronics and intelligence in the sensor. This means that sensors are more frequently required to perform the signal conditioning directly in the sensor, therefore reducing component count, whilst offering faster measuring speeds.

Next-generation eddy current ECT sensors

Eddy current sensors can be used with all electrically conductive materials. As eddy current penetrates insulator materials, even metal behind an insulating layer can be used as a measuring object. A special coil winding means that very compact sensor designs are possible, which can still be used across high temperature ranges. All eddy current sensors are insensitive to dirt, dust, moisture, oil and pressure.

Micro-Epsilon's miniature eddy current sensors are recognised worldwide. With sensor diameters from 2mm and cable diameter of just 0.5mm, these sensors are the smallest standard manufactured eddy current sensors in the world today.

Micro-Epsilon's Embedded Coil Technology (ECT) represents a technological breakthrough in eddy current sensor design and manufacture, enabling the previous limitations of eddy current sensors to be overcome. Due to its ultra-compact design and by using new inorganic materials in its construction, the new eddyNCDT ECT sensors provide almost unlimited scope in terms of the external design and geometrical shape of the sensor. This means sensors can be adapted to suit virtually any application requirements.

EddyNCDT ECT sensors offer extreme

www.micro-epsilon.co.uk

"Micro-Epsilon's Embedded Coil Technology (ECT) represents a technological breakthrough in eddy current sensor design and manufacture, enabling the previous limitations of eddy current sensors to be overcome."

mechanical robustness, resulting in longer service intervals and higher temperature stability. The complete circuit electronics can be integrated into the sensor, providing an even more compact measurement solution for OEMs and machine builders. The sensors are also suitable for harsh operating environments, including high vibration, impact shocks and high operating temperatures as high as 350 deg C. Sensors have been produced with extremely low thermal drift and with temperature errors of less than 20 parts per million per degree Kelvin.

New technology for capacitive sensors

Capacitive sensors offer the highest precision of any non-contact sensor technology. The latest electronics make it possible to offer resolutions in the picometre range. Generally, these sensors are used to measure against conductive targets, but certain insulators can also be measured.

Capacitive sensors are designed as guard ring capacitors. In practice, almost ideal linear characteristics are achieved by using these sensors. However, a constant dielectric between sensor and target is required for a stable measurement; the system reacts sensitively to dielectric changes in the measuring gap. As thermally induced conductivity changes have no influence on the measurement, the principle is also reliable where there are strong fluctuations in temperature.

Micro-Epsilon's new generation capaNCDT CSH sensor utilises a special ceramic substrate that provides extremely high temperature stability. Virtually unlimited sensor geometries can be developed using this technology. For example, an extremely flat sensor has been produced with an installation height of just 4mm. This technology overcomes the previous limitations of cylindrical sensor designs. To date, a maximum resolution of 0.037nm has been achieved using these sensors.

Compact laser sensors

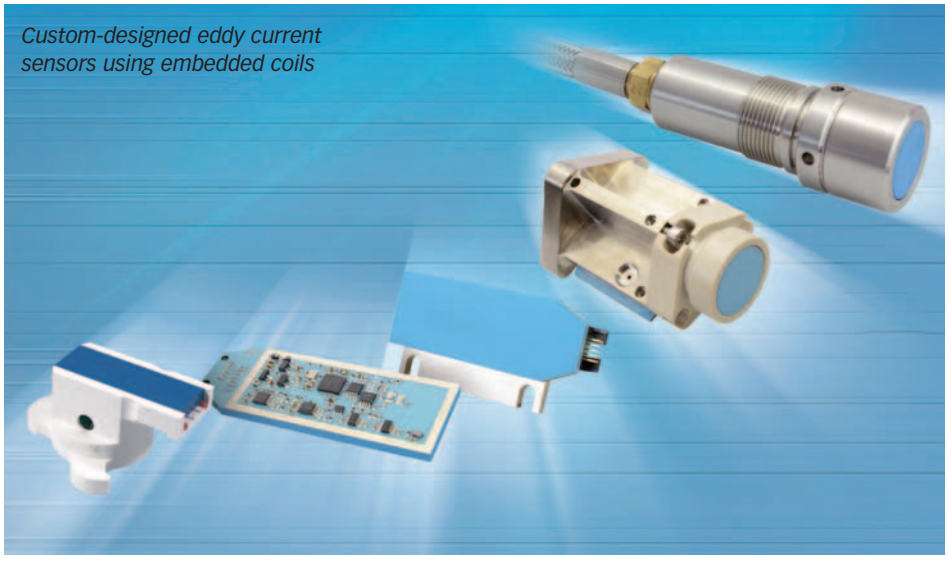
By integrating smart electronics in the sensor itself, laser triangulation sensors are an excellent example of how much smaller sensor systems are becoming. Most conventional sensors require a separate electronics unit as well as the sensor itself. Micro-Epsilon's optoNCDT 1302 and 1402 sensors have a very small housing in which the complete electronics are integrated without sacrificing sensor performance. The two series include twelve different measuring ranges between 5mm and 600mm. Other sensors in the range can measure up to 2m.

The real advantage of using this measuring principle is the relatively large stand-off distance from the target. For hot or moving targets, it is advantageous to be able to measure from a large stand-off distance. Using the optoNCDT laser sensors means that very small spot sizes can be achieved, which is often critical to the application. The spot size can be in the range of a few micrometres and so can also be used for targets of similar size.

Miniature confocal sensor uses gradient index lenses

Extremely high resolutions are possible when using confocal chromatic measurement technology. Resolutions in the nanometre range are typically achieved by expanding the colour spectrum. As the colour, which is in the focal point, is used for distance information, confocal sensors have a very small measuring spot that enables measurements on particularly small objects. Therefore, even the finest scratches on a surface can be measured reliably.

The beam path of the sensor is compact and concentric. This means that measurements inside bore holes or test tubes, for example are possible. For measurements such as these, the confocal miniature optoNCDT 2402 sensors, which have a sensor diameter of just 4mm, are ideal. Five sensor models cover a measuring range from 0.4mm up to 6.5mm and achieve a resolution of 0.016µm. These sensors have been unrivalled since their launch in 2007. With the launch of the optoNCDT 2402 sensor, a reduction of the diameter from 23mm to 4mm was made in one step. Thickness measurement of transparent films, boards or layers is possible using these sensors. In contrast to other methods, the system only requires one sensor for a measurement of this type. As the measurement is only performed using white light, no laser safety regulations apply. The sensors can also be used in potentially explosive areas and in systems that are susceptible to EMC.



Custom-designed eddy current sensors using embedded coils

"Great software will be what separates winners from losers – just as it is driving the mobile phone market today."

Has the future already arrived?

Steve Ruddell of ABB looks at the impact of drive technology.

It is some 40 years since ABB developed the world's first variable speed drive (VSD). There has been some incredible technology developments during that time to create the amazingly compact and function-laden drives that we have today. Yet, despite the past decades, the technical advances, the marketing hype and the wider acceptance of VSDs; the take up has, in many ways, been remarkably slow.

So why is this? What more needs to be done to change people's thinking? About a decade ago, I read an article that identified several issues holding back the VSD market. One of these was 'asset aversion'. This is the reluctance of industry to own equipment, especially that which is gaining in complexity. Add to that the recent recession and few companies are in the mood for big investments in machinery, preferring smaller, simpler to buy and cheaper to run options. This may go some way to explaining why the take-up of the Carbon Trust's interest-free loans has been somewhat disappointing and why it is estimated that today, fewer than 10% of electric motors have some form of variable speed control.

The first practical flux vector drive, launched by ABB in 1984

Energy saving and carbon dioxide (CO2) emission reductions are obviously the key drivers for increasing take up. There is not one other piece of industrial equipment that can have such an impact on energy and CO2 as a VSD. The evidence is unequivocal. Just take a look at the references tucked away at www.abb.co.uk/energy if any proof were needed.

So what about the future of drives themselves? Where is the technology likely to go?

A decade ago it was argued one factor holding back the drives market was the physical size of the products. Today's drive is some 80% smaller in physical size than its predecessor. From the semiconductors to the heatsinks to the chokes, capacitors and enclosures: all have advanced to such a high standard that size is reduced and reliability has improved.

Today's drives can be 80% smaller than their predecessors

While traditional drives are getting smaller, the technology is also being applied to a completely new type of application. These applications are demanding even smaller drives with the result that the shape of drives as we know them are being superseded by drives that need to fit the application. Thanks to developments in semiconductors, drives are finding homes in wind, solar and hybrid vehicles, as well as applications like pizza ovens, spa baths and running machines. In fact these new sectors, especially wind and solar, are growing at a rate that we did not anticipate. The impact on traditional drive applications is that they suffer from sometimes long and unpredictable lead times as demands for semiconductors grow. But I believe this is a short term problem, as new semiconductor manufacturing capacity is already coming online.

New materials will continue to be developed, of that there is no doubt. We may even see semiconductor switches that allow the drives to operate at higher temperatures. This would make it possible to further shrink the size of the drives and increase power density. The compact size and high temperature will place special demands on the cooling and all the drives may use heat pipes to transport heat to a place where it can be disposed of or easily recycled.

Future VSD wars will be fought over software, I believe, not hardware. We are already seeing this as a key driver within our own products. Software reduces start-up, improves performance, improves reliability and provides remote services throughout a drive's life. Software will enable better usability through better and simpler interfaces with the user. I argue that great software will be what separates winners from losers – just as it is driving the mobile phone market today.

In fact, can you imagine if such onboard intelligence resulted in the drives being an integral part of control, maintenance and monitoring system? Self-healing control systems, with control functions spread between a number of drives, so if one drive develops a fault or error, another drive can actually diagnose and fix the fault? Provided the fault is software, the drives in close proximity actually look after each other. At commissioning, the drive automatically detects the characteristics of the load or process and uses this data to set up its own parameters.

Drive technology is being applied to completely new types of applications

Steve Ruddell • ABB Limited • T: 01925 741 111 • F: 01925 741 212 • E: enquiries@gb.abb.com

www.abb.co.uk/energy

"Support must come from the UK Government, which must embrace the manufacturing sector in its vision for the future"

Looking to the future of UK manufacturing

Nigel Platt of ABB offers a manifesto for manufacturing success.

I recently attended a debate at the Royal Academy of Engineering, entitled 'This House believes that a manufacturing sector accounting for at least 20% of GDP will provide the only basis for a balanced UK economy'. The debate argued both for and against the case for building a greater contribution for manufacturing towards the UK's GDP (its current share stands at 13%).

In his plea in support of the motion, Andrew

Simms of the New Economic Foundation attempted to redefine the debate as 'why making stuff in the UK matters'. His argument was that the continued ability to 'make stuff' presents the best opportunities to protect against future recessions and avoid over-reliance on one sector.

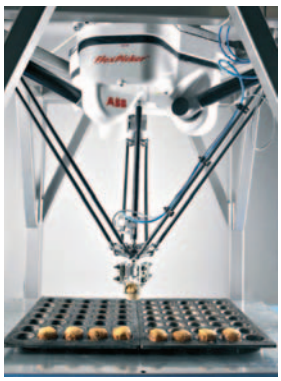
Certainly, when you look at the past two years, it is almost certainly the resilient performance of the UK's manufacturing sector that has left us in a comparatively better state than many other countries following the recent recession.

The UK remains the 6th largest manufacturer in the world, despite some high profile manufacturing closures. Overall, the UK's manufacturing output remained stable during the recession and today manufactured goods make up more than 40% of our exports. This is supported by the September statistics from the Office for National Statistics, which shows a continued growth of 4.8% in UK manufacturing in September 2010 compared with September 2009.

In his recent article 'Re-manufacturing consent', Dr Leslie Budd, reader in social enterprise at the Open University Business School, expresses his surprise that manufacturing is still not the centerpiece of economic policy in the UK. I must say that I agree with this. I also agree with his opinion that more needs to be done to educate people at all levels about why manufacturing continues to matter in the UK.

For starters, manufacturing in the UK is not dead. 'Manufacturing', in its widest modern sense, covers everything from finished metal products through to the food, pharmaceutical and personal care industries to name but a few.

On the same point, today's manufacturing environment is nothing like that of the late 1970s, an era which is often singled out by those keen to distance us from a manufacturing-based future. Vast strides forward have been made in everything from quality to efficiency and productivity. Products made in the UK continue to perform a vital role globally.



Nor do we have to accept that we cannot compete with low cost countries. As someone involved in the supply of robots and automation to industry, I can point to many examples of where the adoption of robots and automated technology has helped UK companies of all sizes to boost their international competitiveness. Indeed, the comparatively similar costs of implementing automation systems worldwide mean that UK companies can compete equally.

Robots can be used across a diverse range of applications

Tackling the negative perceptions about manufacturing is about putting in place the right conditions to create the next generation of engineers. It is about encouraging investment and participation in research and innovation. It is also about encouraging companies to put in place the best available technologies, such as robots and automated production processes that will help them to be more competitive.

So how do we achieve this? First, it is about ensuring that everyone, from the public through to the Government, understands that manufacturing and engineering have a vital role to play in the UK's future prosperity. The creation of a longer term view will in turn help to stimulate investment, with companies investing in new capital equipment and the fundamentals put in place to educate and train future engineers.

But we can't do it alone. Support must come from the UK Government, which must embrace the manufacturing sector in its vision for the future and then do all it can both to understand it and nurture it, through the provision of investment and removal of the barriers that have hindered its growth.

Whatever happens, the question that will determine the landscape of the UK's manufacturing sector in 30 years' time really boils down to this: do we want to merely invest for the present, doing what's needed to directly tackle our current problems or do we want to invest in laying down the foundations for future growth?

Nigel Platt • UK Sales & Marketing Manager for ABB's UK robotics business • T: 01908 350 300 • E: robotics@gb.abb.com

www.abb.co.uk/robotics

TFC GROUP

Can you improve your business?

Martin Clarke, (above left) TFC Group Managing Director & Brian Goode, TFC Technical Director

Martin Clarke, TFC Group Managing Director & Brian Goode, TFC Technical Director, look at ways in which their company can help customers achieve their goals.

For over 40 years, TFC Europe Ltd has been supplying technical fasteners and fixings to industries throughout Europe. TFC's strategic approach to location and efficient distribution streams has enabled the Sussex-based company to position itself as a leading technical and logistical supplier to Europe and beyond. Servicing over 24 countries with its products, TFC has been at the forefront of technical fixing and fastening solutions, taking the company beyond being a 'distributor' to that of a 'technical partner', equipped with the knowledge and expertise to deliver solutions for industry.

It is the in-depth skill base that TFC provides to its clients that add a level of service beyond that of being a distributor and builds on the platform of trust the company has with leading manufacturers such as Smalley. TFC works closely with its partners to ensure it draws on a wealth of expertise and knowledge to provide solutions when they are needed. TFC offers an unparalleled level of design and logistical know-how to ensure clients receive the solution fit for purpose.

TFC's logistical out-reach stems from the locations of its key distributions centres in the UK and Europe and the company has focussed on ensuring that it provides systems for clients which make ordering and reordering components a thing of the past. With an eye on saving client's money, TFC's flexible supply chain management systems take the pain out of replenishing stock and helps drive down cost through channelling orders via a one stop shop approach. Whether you operate a track-line feed, direct-line feed or point of use twin-bin operation, TFC can arrange multi-weekly visits to sites, with automated direct or remote re-ordering to ensure an efficient, continuous, and worry free supply of stock.

As well as holding individual approval from some of the world's leading companies, TFC has been a BS/EN/ISO 9002 Approved Supplier since 1990 and has also achieved ISO 9001:2000 approval incorporating design status. TFC's comprehensive product training ensures our sales team are aware of the latest product knowledge and design solutions. We are always available to give advice and discuss specific fastening applications.

TFC has made strategic acquisitions to encourage growth and increase product range and form part of the increased customer's service portfolio to offer customers an increased knowledge base and distribution platform. As TFC moves into 2011 its strategy ensures a continuous improvement to processes, ensuring projects are delivered to agreed timescales and continuing to be ambitious for growth from organic and invested platforms. Key focus for the group will be:

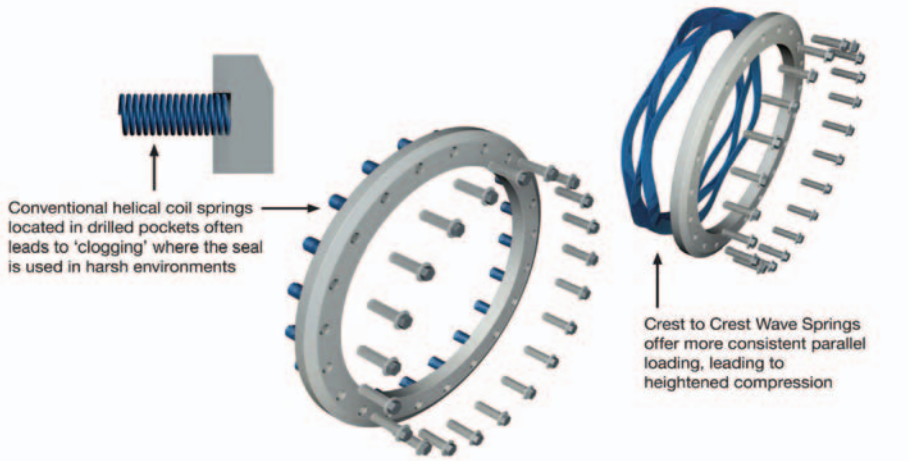
- Growing the business and being passionate about its quality reputation
- Continuing its customer focus and developing important partnerships
- Leading with innovative product marketing and with technical sales
- Developing the service centre opportunities
- Developing acquisition strategy through complementary growth opportunities

For customers this approach means greater choice and the opportunity to consolidate their own product purchasing, saving time and money through simplifying the order process. A new tool to aid this process is TFC's new online ring and spring part search facility at: www.tfc.eu.com

The new search facility catalogues over 4000 products, making it easy to find the part you need quickly. The simplified search tool breaks down searching into bore and shaft parameters for both rings and springs. TFC's website pulls together both standard and technical products with its ability to provide a single source supply chain management system for

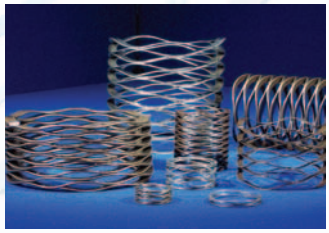
www.tfc.eu.com

"Integrity in any mechanical system is paramount and if the integrity is compromised through ingress of dirt, sludge or other substances mechanical breakdown is inevitable, costly and time-consuming."



customers. The combination of TFC's deep-seated knowledge of products and industry, offer customers the level of trust and support needed in business. Over 40 years of experience, coupled with innovative supply chain and logistical resources have placed TFC as one of the UK and Europe's leading fixing and fastener suppliers serving industry today.

Industry applications for TFC products are immense with the company working successfully for many years supplying components to aerospace, the oil industry, automobile industry, manufacturing as well as building and construction. Many of these components such as the Smalley Wave Spring or Crest to Crest Wave Spring fill a void in industry especially where a traditional coil spring has too large a footprint to function at its optimum efficiency.



Though there have been many refinements to the traditional coiled spring, an advance in recent years has been the introduction of the Crest to Crest Wave Spring. Tooled using a single flat wire process, the Crest to Crest Wave Spring offers a significant reduction in axial and radial space.

Industries such as automotive, aerospace, petro-chemical, and manufacturing in general have seen the development of many products that have resulted in a reduced footprint of many of the spring components. Recent developments have seen single Crest to Crest Wave Springs replacing an arrangement of inline coil springs in applications that have benefited from size reduction, but the advantages don't end there.

With a single Crest to Crest Wave Spring used instead of a series of coil springs in any application (see illustration) the reduced spring rate enhances the life of the seal face because the load differential at maximum and minimum work heights is greatly reduced. Longer seal life is gained as a result of the Crest to Crest Wave Spring offering a greater travel, i.e. the difference between the work heights is greatly increased. The fact that we now have a single component offers more consistent parallel loading of the seal faces, leading to heightened compression.

In the old system the alignment of a series of coil springs often led to 'clogging' between the turns especially where the seal is being used in particularly harsh environments. This 'clogging' would lead to leakage when the seal is stationary. The use of a single Crest to Crest Wave Spring also brings the benefit of a reduction in tooling of the mating components; with pocketed coil springs there would be a need to drill numerous beds for each coil spring. This is obviously eliminated from a single crest spring placement. This also improves assembly times since only one component is involved.

Integrity in any mechanical system is paramount and if the integrity is compromised through ingress of dirt, sludge or other substances mechanical breakdown is inevitable, costly and time-consuming. TFC has products such as Smalley Laminar Sealing Rings to help overcome some of these issues. A Laminar Sealing Ring is a metallic labyrinth seal consisting of multiple rings in a groove, and is designed to prevent the ingress of dirt or splash liquid from contaminating components.

The arrangement of the Smalley Laminar Sealing Rings and the specific orientation of the rings are dictated by the application and severity of the environment. Since there is no friction with other rotating components, Smalley Laminar Sealing Rings are ideal for high speed applications. Smalley Laminar Sealing Rings are often used as a primary seal or as an alternative means of sealing components in assemblies from contamination. Smalley offers several sealing ring configurations to accomplish this. Since they are produced from metal (not rubber or neoprene), Smalley Laminar Sealing Rings can withstand higher temperatures, more corrosive environments and other extreme conditions than common O-Rings or conventional rubber seals.

Smalley Spirolox Retaining Rings and Snap Rings are other TFC products made from pre-tempered flat wire without the need of expensive tooling, by edge coiling - which means unlike conventional circlips, special designs can be easily accommodated and design changes can be made without additional cost. Smalley Spirolox Retaining Rings and Snap Rings are coiled to the exact diameter required. Smalley Spirolox rings have a uniform cross section, no protruding lugs and are burr free, they offer a 360° retaining surface and are directly interchangeable with standard imperial and metric circlip grooves. Smalley edge coiled retaining rings can be coiled to specification in any diameter between 5mm-2300mm.

Design engineers commonly associate the word 'retaining ring' to a basic style or type of retention device. In reality, retaining ring styles are nearly as diverse as their applications. Smalley retaining rings offer an alternative and in many instances an advantage over the more common retraining rings available on the market today.

TFC Group Tel: 01435 866011

Arresting the decline in oil production

Ian Anderson of Camcon Oil looks at the way in which smaller companies can maximise oil production.

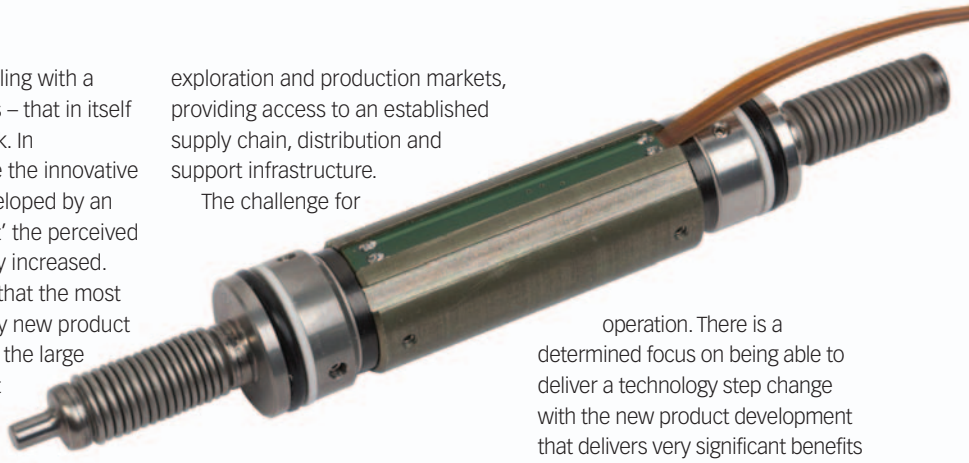
There is much speculation and debate about the point in time when the maximum rate of global hydrocarbon extractions is reached – commonly referred to as 'peak oil'. Regardless of perception or reality, oil operators are under increasing pressure to expand their accumulated recoverable reserves and at the same time increase the efficient extraction of hydrocarbons from their reservoirs.

There is no doubt that new innovations, technologies and product solutions will play a significant role in the coming years to respond to the global quest to arrest the decline in oil production and hence return to maximising the production from oil reservoirs. The key to increasing recoverable reserves is research, development, manufacture, supply and use of new product inventions. To facilitate the timely introduction of new technologies, the attitude towards embracing such solutions will without doubt change.

As expected, oil operators view the adoption of new technology solutions as a commercial risk. Adopting any new approach means dealing with a number of unknowns – that in itself contributes to the risk. In circumstances where the innovative solution is being developed by an industry 'new entrant' the perceived risk is understandably increased.

Tradition dictates that the most obvious source of any new product initiative resides with the large service suppliers that carry the appropriate infrastructure, expertise, industry knowledge and resource in place to bring the product to market. However, these large integrated service companies tend to focus on incremental developments with a large potential market that can substantially increase their market share. It is invariably left to smaller service companies and new entrants to exploit ideas with a smaller initial market, since even a small increment in market share can translate into significant growth for a smaller company. New entrants and smaller suppliers are invariably the source of radical, new innovations.

New entrants operate in a more flexible manner and are able to set up appropriate business models quickly to facilitate the supply of the new technology to the oil operators. They certainly seek partnerships with established service companies that have an understanding of the exploration and production markets, providing access to an established supply chain, distribution and support infrastructure.



The challenge for small, new entrants is to overcome the obvious barrier to entry where there is a significant lack of incentive for global supply companies to adopt innovative technologies, particularly if they potentially displace established profitable product lines. Barriers to entry are especially evident for companies offering disruptive technology solutions.

Despite numerous barriers to enter this market place, new products and innovations are entering the supply chain process and progressing to proving field worthiness. Camcon Oil Limited gave due consideration to all of the challenges associated with breaking into the oil industry before committing to a programme of business development. It was imperative that Camcon Oil Limited did not just replicate and deliver a 'me too' solution to reside alongside the established methods of operation. There is a determined focus on being able to deliver a technology step change with the new product development that delivers very significant benefits to the Oil Operators. Camcon Oil identified an opportunity to develop an intelligent device that introduces management and operational advantages far beyond current capabilities, developing an intelligent gas lift unit offering variable operating valve combinations and eliminating the need for any well interventions. This is an essential ingredient for any new product introduction, especially from a business that is classified as a new entrant.

To complement the product development programme, product distribution, installation and support agreements in selected geographies are now in place, based upon traditional OEM type supply agreements – the remaining challenge is to conclude the product endorsement process with our supporting oil operators through successful field trials and continue with the product supply to the industry.

Camcon Oil Ltd. Button End Industrial Estate, Harston, Cambridge CB22 7GX T: +44 01223 873650 E: enquiries@camcon-oil.com

www.camcon-oil.com

RENOLD CHAIN

Evolutionary chain

In the thirty years since *Eureka* launched it has covered all of Renold's major innovations. We look at some of them here.

In 1880 Hans Renold invented the bush roller chain, having founded the Hans Renold Company, in Salford, the year before. A hundred years later, when Eureka launched, the basic design had remained the same but Renold had become an international power transmission company, and the name Renold was synonymous with high quality, precision engineering.

During that first 100 years Renold pioneered the use of enhanced manufacturing techniques such as shot peening, and developed advanced designs such as seamless bushes and roller ends, high-waisted plates, curled bushes and other innovations that were delivering longer wear life on industrial machinery that was becoming increasingly more demanding.

In more recent times technology has been developed that has resulted in a whole new breed of transmission chains designed to combat specific problems, and Renold refers to this new range as Solution Chain. For instance, on some applications lubricating chain might be difficult or undesirable and so Renold developed Syno, a lubrication-free chain. Syno is dry to the touch, with all the lubricant contained within an ingenious sintered bush that releases just the right amount onto the bearing surfaces when the chain is operational. When the machinery is switched off all the lubricant returns to the bush and there is no possibility of product contamination.

In 2000 Renold launched Synergy a chain delivering astonishing wear resistance and longevity for arduous applications, and wherever short chain life might be a problem. Some companies cost out machine downtime at upwards of 50K an hour and with Synergy lasting six times longer than the next best product on the market it has helped many factories cut downtime and make significant savings.

Renold now have a whole range of solution chain products designed to provide high performance and longer wear life on applications where environmental issues and mechanical factors would cause rapid wear on standard chain.

The application of new technology is also enabling Renold to help OEMs design better products, often with unique selling points and clear customer advantages. In 1999 Renold launched Smartlink, an electronic sensor unit that is attached to the side of a length of chain and is capable of recording dynamic load data while the chain is operational. This was a groundbreaking development because for the first time engineers were able to analyse stress and load data taken from chain on real applications, something that had never been done before.

Due to the size of the initial Smartlink unit it could only be used on larger chain such as that used on theme park rides. Working closely with designers the results were incredible. Smartlink was recording everything as it happened, so, if shock loads were occurring, Smartlink would record them and point to exactly where in the system they happened. Using this sort of data designers have been able to modify and improve designs and more accurately specify the precise chain size needed for their particular applications.

Chain technology will continue to advance in the same direction and future chain will last even longer and require less maintenance. Technology like Smartlink will develop with the units becoming smaller and lower in cost. Smartlink was originally only suitable for large pitch chain, but now, with the reduction in size of its electronic components and battery, it can now be supplied for half-inch pitch chain. In the future perhaps every chain will have Smartlink fitted as standard, and it will tell engineers when it needs maintenance and when it needs to be replaced.

Renold Chain timeline

1980: Renold sets the standard for quality, precision roller chain

1997: Renold launches Syno an intelligent chain that lubricates itself

1999: Renold launches Smartlink the first stress and load sensor that can be attached to chain on real applications

2000: Smartlink achieves Millennium Product status and is put on show in the Millennium Dome

2000: Synergy is launched, the longest lasting chain available anywhere

2010: Synergy is improved with enhancements to the chain's initial wear performance

www.renold.com

HepcoMotion®

HepcoMotion celebrates over 40 years of trading

A look at the technology and principles that have kept HepcoMotion trading for four decades.

Designing a unique engineering principle and making it a commercial success is quite an accomplishment. Developing it and embracing complementary technologies to the point where the business becomes a world leader in its field takes that achievement into a different league. HepcoMotion® has achieved both and in 2009 celebrated its 40th year of trading.

Today HepcoMotion® is one of the world's foremost innovators in and manufacturers of linear motion technology. This can be attributed to continued investment in processes, products and people, which has allowed the company to grow even at times of economic difficulty.

Made in Britain

Despite the global status of HepcoMotion®, the heart of the company remains very much in the UK and there are several important reasons for this. First and foremost is the depth of skills of its people in both manufacturing and applications engineering. As a result HepcoMotion® manufactures the majority of its products at its factory in Tiverton, Devon with critical bearing elements being produced by another Group company in Braintree.

A field in which HepcoMotion® has always excelled is continuous linear motion and recent developments have again propelled the company to the position of market leader for rings and continuous circuits. The company can now produce rings with diameters from .1m to 8m, or even larger. Indeed it has perfected the art of manufacturing ring segments to ensure concentricity and smooth running of the finished product.

While there has been resurgence in demand for individual linear motion products, HepcoMotion® specials and assemblies are still key elements of the company's business. Indeed almost a fifth of its floor space is devoted to assembly and the company has invested heavily in flexible manufacturing to ensure even last minute changes can be accommodated to customer specification.

T: +44 (0) 1884 257000 • F: +44 (0) 1884 243500 • E: sales@hepcomotion.com

www.hepcomotion.com

EUREKA

THE MAGAZINE FOR ENGINEERING DESIGN

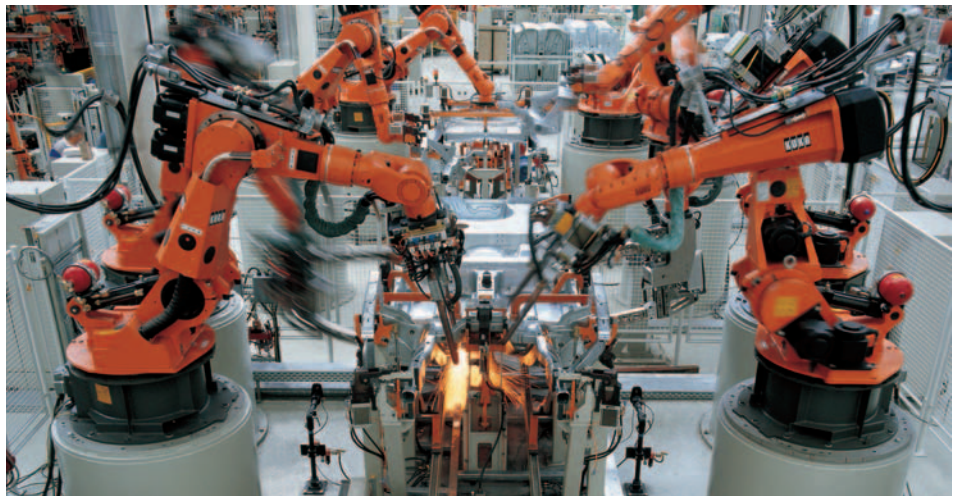
Inspired by innovation

Passionate about engineering

www.EUREKAmagazine.co.uk

Controlling robots

Tom Shelley reports on improving the integrity of robot control code for mission-critical applications.

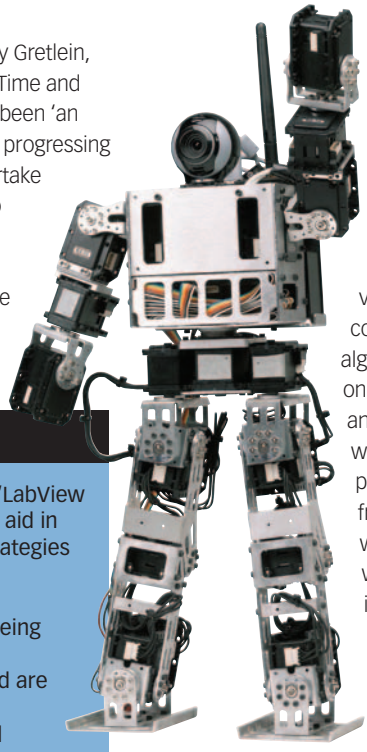


Special software packages have become available to ease the design of novel robotics, now that autonomous and semi autonomous machines are becoming mainstream in military and civilian undersea applications.

With the next generation expected to become common to assist the disabled, as well as working in the factory and warehouse, integrity of software is essential. But new tools and the re-writing of underlying code has produced software that runs noticeably faster and with greater reliability.

At the recent NIDays event, Shelley Gretlein, senior group manager, LabView Real-Time and Embedded, described how there has been 'an explosion in recent years' in robotics, progressing from single armed machines to undertake repetitive tasks on production lines to machines to explore and work in the underwater environment, undertake increasingly sophisticated tasks on the battlefield and assist the disabled.

She then explained that for such applications, software needs to be exceptionally reliable and able to react very quickly to changed situations, both applications requiring running on an FPGA (Field Programmable Gate Array) chips instead of in a more conventional computing environment.



The general approach of the new software package – LabView Robotics Software – is to assist the 'sense, think, act' process. Gretlein summarised the challenges for writing robotics applications as: coming up with a generic approach to addressing a very wide variety of possible complex tasks; translating algorithms into code to run on embedded hardware, and; 'connecting to the real world' with different possible sensors available from different vendors, working in many different ways with different interfaces.

A possible solution to the first challenge, she said, is a generic robot task development strategy developed by students at Franklin Olin College in Needham, Massachusetts. The answer to the second and third challenges, she argued, was to use the latest LabView software, with its automatic FPGA programming tools and a library of interfaces to 'commonly used sensors and actuators'. Tools in the Robotics package include blocks of code to effect obstacle avoidance and path planning, and the ability to run sensor and actuator code asynchronously at their 'native' speeds. We later learned, when trying our hand at programming in a 'hands on' session, that it is possible to prioritise function tasks so that urgent jobs, such as handling motor drive and encoder position pulses are done first, and build in periods in control algorithms to allow other tasks to be undertaken as required.

Novel engineering applications to which the software is being applied include a 'Virtual Underwater Laboratory' at the University of Limerick, to assist development of unmanned underwater vehicles, and BEAR, a Battlefield Extraction Assistance Robot, to rescue wounded soldiers or victims of terrorist attacks without having to wait and see if there is going to be a follow up attack or sniper attempts to kill rescuers.

One aid to improve reliability in all of NI's software was revealed by Danny Thomson, test systems development engineer with Motorola, who explained that, in his opinion, the biggest reason for users to upgrade to LabView 2010 was that this version independently saves source code and VIs – LabView programme and subroutine files originally given such a designation because they were 'Virtual Instruments'. This means that when something in the control logic is changed, only one file changes when the change is compiled, whereas in earlier versions, up to 88 files would be changed, making proper peer review of all changed code impracticable.

www.ni.com

Design Pointers

- NI has brought out a special 'LabView Robotics Software' package to aid in the development of control strategies for autonomous mobile robots
- Such machines are already being used in warehouses, on the battlefield and under water and are being experimentally being developed to help the disabled
- Absolute integrity of control software is essential in all such applications, but the new tools and improvements in the underlying code greatly assist this

Solving the problems

Some solutions to problems in controlling motor drives are assessed by Tom Shelley.

Control and automation equipment becomes cleverer, but so do the demands to improve safety and reliability; reduce energy and costs, and ward off cyber attacks.

On this last matter, the arrival of the Stuxnet worm shows that computers controlling industrial systems are as vulnerable as the normal varieties. When asked about the infection in Iran and elsewhere, a spokesman from Siemens responded by pointing out that it was 'very specifically targeted'. This was certainly the case, since it was apparently designed to only affect inverter drives made by Fararo Paya in Iran or Vacon in Finland, and only if they were able to operate at between 807 Hz and 1210 Hz, speeds appropriate to uranium enrichment gas centrifuges. But a 'Rubicon' has now been crossed and the Siemens spokesman admitted: "People are developing more and more sophisticated threats." A solution to this kind of problem is now available from Norman Data, in the form of a 'SandBox', which unlike most anti-virus software, reacts to previously unknown threats by allowing executable code to run on a simulated virtual computer to see if it does anything potentially bad, before letting it through to the computer or that part of the computer that is actually executing the control task.

According to ABB, most winding failures result from bearing failures, followed by insulation breakdowns

Most industrial system breakdowns, of course, are not caused by malicious writers of software, but by more mundane problems such as electric motor overloads leading to winding burnouts and less often, by electronic failures in inverters and controllers. Most winding failures, according to Steve Ruddell of ABB, result from bearing failures, followed by insulation breakdowns resulting from prolonged overheating. He argues that if an old motor does burn out, it is almost certainly more economical to replace it with a new and more efficient one than to pay for a rewind. And if the purchase of the new motor is coupled with the purchase of a matching variable speed drive, manual starter,or soft starter and overload relay, a fast acting trip will prevent the new motor burning out in the event of an overload.

To guard against electronic failure, keep processes going, or just to save money, Control Techniques has brought out a device called an 'SPM Power Selector'. Combined with modular Unidrives, this enables automatic re-routing of connections between SPM control and power stages. In the case of a system where serious consequences result if it comes to a stop, it can either switch in a normally redundant spare drive, or keep the system going at half power by switching out a failed member of a pair of drives and reducing the speed of the remaining one.

In a complex system, such as a rubber-tyred gantry crane, there are normally separate drives powering motors for lifting, traversing and travelling longitudinally. Since there is no normal circumstance in which the crane will be lifting and travelling longitudinally at the same time, it is possible to take out one complete 55kW drive by allowing the Power Selector to switch between motors, so that the same pair of 110kW drives powers either the 215kW hoist motor or the four 30kW long travel motors. And in a rolling road test rig for heavy goods vehicles, it is possible to automatically switch parallel drives in and out to match output current to test tasks. Since torque is most easily measured by monitoring motor current, rather than using torque sensors, running smaller numbers of drives at full power rather than running more drives at less power, improves the accuracy of the torque measurements.

www.norman.com
www.abb.co.uk/energy
www.abb.co.uk/lowvoltage
www.controltechniques.com

Design Pointers

- The advent of viruses for industrial control systems is worrying, but a solution has been found in terms of a virtual computer within the system, that can allow new viruses to execute their code in a protected environment
- Old motors that burn out should in many cases be replaced with new and more efficient motors with modern control gear to protect them against overloads, rather than pay for rewinds of obsolete equipment

Lightning combines direct and parametric

Tom Shelley reports on the shape of PTC's long-anticipated combined CAD software.

As widely expected, PTC's Project Lightning, or 'Creo' as it is now named, is 'created from the elements of Pro/Engineer, CoCreate and ProductView', which are to be re-branded, 'creo elements/pro', 'creo elements/direct' and 'creo elements/view' respectively.

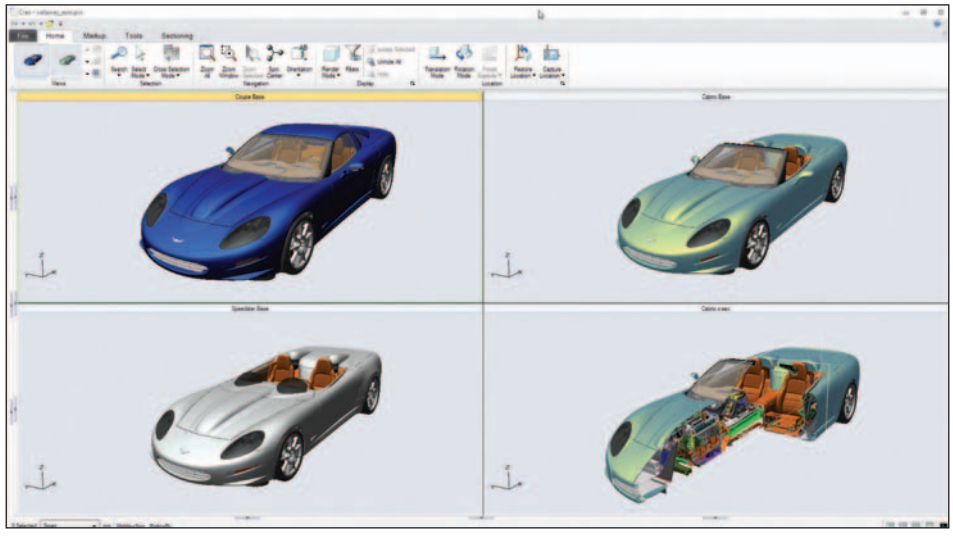
There are, however, two breakthroughs in the amalgamated offering. The first is that it will be possible to take a parametric model, bring it into a direct modelling environment and then manipulate it, without losing the parametric elements of the parts.

So, when a nozzle that has been designed using the parametric modelling facility is imported into a directly modelled assembly in order to create ribs, drafts and rounds, then move the nozzle to a new position – all without a feature tree – the nozzle remains a parametric model. Hence, if the overall model is saved and opened back in the parametric environment, the parametrically designed nozzle can be manipulated using its parametrics.

It is now fairly general amongst CAD packages to be able to import a parametric model as geometry and to then manipulate it using direct modelling techniques. But once the feature tree has been abandoned, it is, in all the other packages we have seen, not then possible to resurrect any of the parametrics for what were the originally parametric parts of the model.

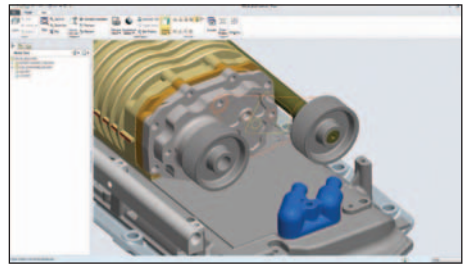
The new facility forms part of what the company calls 'Any Mode Modelling'. Another important aspect of Any Mode Modelling is being able to start in 2D, apply constraints and intelligence, and take these across when developing the model into a manufacturable product in 3D.

The other breakthrough is the idea of 'AnyRoleApps', which in PTC terms means a focused set of tools that allows a particular user to do what they need to do to a model, without confusing them or including tools that may result in their getting lost or stuck.



Hence, a design manager, for example, can review a design, examine internal components and check for interference, without getting involved in all the minutiae of 3D modelling. Similarly, an industrial designer will have access to surfacing tools and rendering, whereas an analyst won't need either of these, but will need access to tools to simplify geometry and undertake FEA.

In addition, 'AnyData Adoption' will permit working with data from multiple CAD environments and 'AnyBOM Assembly' will ease the importing of new parts into a design in order to create alternative configurations. The changed design can be reflected through all aspects of the model. We were told that it would be possible to import a part into a design by this method that did not fit. It would therefore be wise to interrogate the new design to check if the new part fitted, and if it did not, create an alternative modification. It is possible to create rules to prevent this but such rules would have to be written by the user.

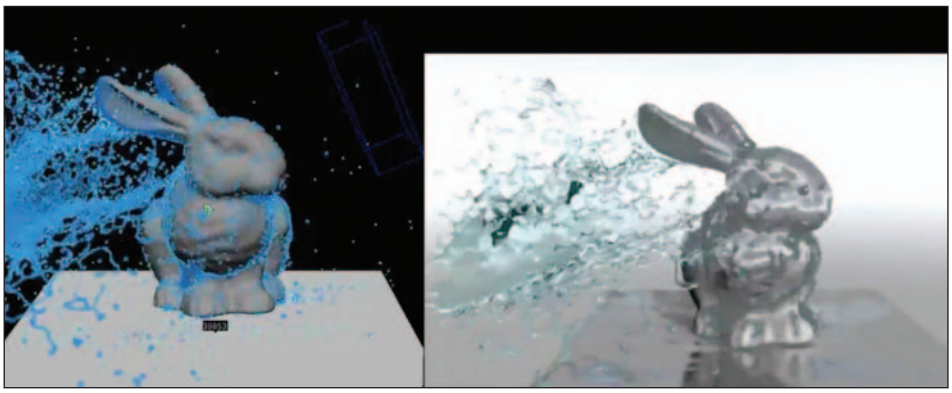


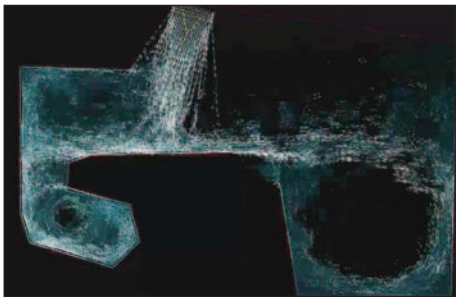
Creo is not available right now. Version 1.0 is scheduled to be available as a beta release in Spring 2011, with the full commercial version in Summer 2011. This version will include: conceptual modelling, 2D drafting, 3D parametric and direct modelling, simulation – everything currently available in 'Mechanica' including FEA and thermal analysis; schematic capture, 3D technical publications and visualisation. Version 2.0 with more 'Apps' is to follow with a beta in Summer in 2011 and full commercial version in Fall 2011. The current version is described as 'Alpha', and has been made available to selected PTC customers in order that they can input their specific needs.

http://creo.ptc.com

CAD shapes up for the future

Tom Shelley reports on up and coming developments in the CAD world, some of which can be trialled, and others expected to soon become available.





"We are taking a lot of ideas from video games and seeing how we can incorporate technologies such as Wii into our products."

Future engineers will be benefitting from interfaces, graphics and modelling advances made in the games and entertainment industries, according to an industry insider at a recent forum.

At Autodesk's recent Digital Prototyping Forum, Gadget Show presenter Ortis Deley described Autodesk's software as already being 'straight out of Star Trek'. But Tim Doidge, the company's technical sales manager Northern Europe, added: "We are taking a lot of ideas from video games and seeing how we can incorporate technologies, such as Wii, into our products."

Keith Perrin, senior industry manager for manufacturing, commented: "The keyboard is still there, even on the iPad, but these are things we are looking into. Maybe in five years' time, you will put your finger on something to wipe it out."

Deley made reference to gloves equipped with receptors, whose positions are picked up by infra red cameras, widely used in the film industry to capture motion and long considered as a means for interacting with CAD. Perrin responded that standards for alternative interfaces were emerging, such as the pinch on smart phones and the Wii. He added that there is already an App for the iPhone called 'Distant Suns'. When the user holds the iPhone up, internal sensors detect its orientation and direction, allowing the app to identify planets and constellations in line of sight. Doidge then mentioned the virtual cameras used to film 'Avatar', which show in real time how the actors look in their alien representations in the film and suggested: "In a few months, a breakthrough technology could lead to a dramatic change in the way things are done."

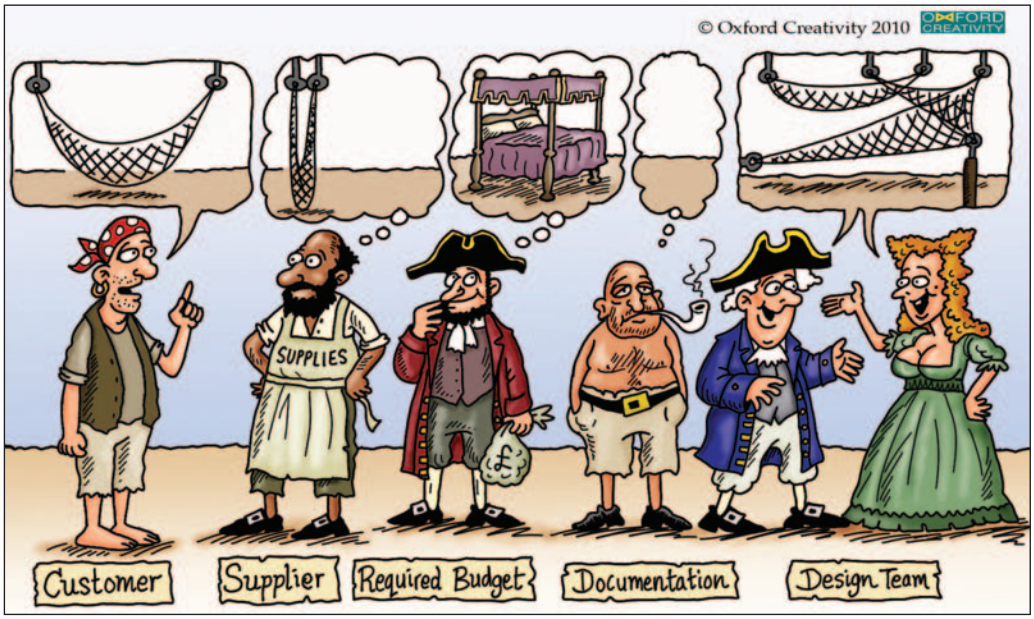
Important changes are already occurring, such as the 'Project Krypton' feedback dials from Autodesk Labs that provide real-time information on a plastic part's manufacturability, cost efficiency, and the environmental impact of the selected material. As well as Inventor and Inventor, the preview add on works with SolidWorks and Pro/Engineer.

The idea has been around for a while, as has downloading CAD software onto mobile phones for sketching. This never really caught on while it was limited to conventional phones and PDAs but, with the advent of the iPad, Perrin said that there have now been 2.5 million downloads of Sketchbook Pro.

Improvements that are to become available shortly include the ability to go from Alias to Photoshop and then back into Alias to edit. Autodesk bought Algor 18 months bringing it into the finite element analysis arena, and recently, said Perrin, a 15 million element problem was solved using a cloud of machines. A preview of an optimisation facility for Inventor that depends on cloud computing is downloadable from Autodesk Labs. Optimisations on desktop have in the past taken hours or days to complete, so for most users, cloud computing is the only sensible alternative. While the software is performing simulations in the cloud, engineer can continue to do other work on their desktop. When the design optimisation is complete, the technology preview's job monitor automatically notifies the user. Mobile users can shutdown Inventor or even the machine after starting. Once the process is complete, the user only has to open their design and enter the optimisation environment, where the results will be waiting.

http://labs.autodesk.com/utilities/krypton http://labs.autodesk.com/utilities/inventor_optimization www.lagoatechnologies.com

Get Everyone Working Well Together Through TRIZ



Get everyone "talking TRIZ"

TRIZ enables everyone to work together to

- Capture all needs
- Understand and define the problems
- Resolve conflicts and achieve opposite benefits for good solutions for all stakeholder

Oxford Creativity regularly facilitates TRIZ problem solving sessions bringing everyone together for fast and effective results. Recent successes include Mars, Single Buoy Mooring, Trelleborg, British Gypsum, Ransomes Jacobsen, BAE Systems and medical device designers.

Get your important stakeholders working together effectively to uncover, define and solve problems using TRIZ.

Learn TRIZ - book now for 2011

25 January: Diamond Light Source

15 February: London

7-10 March: Oxford

9-12 May: Preston

What is TRIZ?

Free 20 minute webinars available

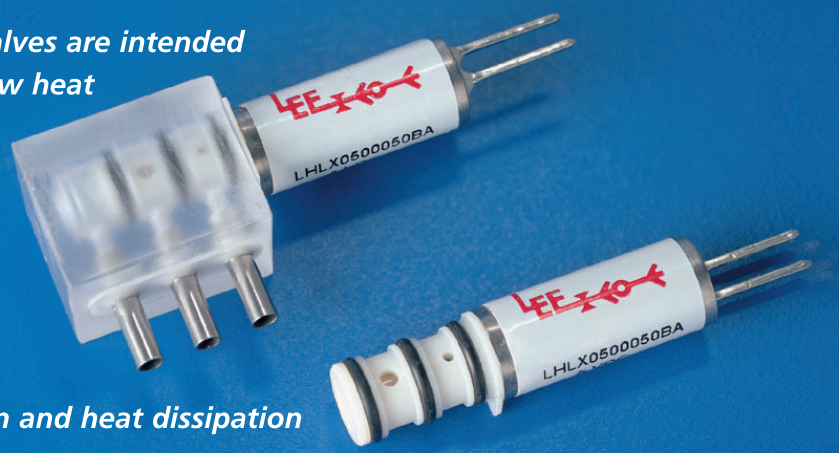
www.triz.co.uk/events.php

Contact Lilly to find out more at: **lilly@triz.co.uk** **www.triz.co.uk** **01993 882461**

OXFORD CREATIVITY

Miniature Latching Solenoid Valve

The Lee latching HDI solenoid valves are intended for applications that demand low heat and power within a small size and are ideal for compact, battery powered pneumatic instruments such as portable oxygen delivery systems and environmental gas samplers.



- *Ultra Low power consumption and heat dissipation (2.8 milliwatt per switch)*
- *Small size (1.12" long x 0.28" diameter)*
- *Flow capacity 6 slpm at 10 psig*
- *Pressure range 0 - 15 psig*
- *5 and 12 volt models available*

SEND FOR OUR FREE PRODUCT CATALOGUE

Tel: 01753 886664 Fax: 01753 889588

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

Innovation in Miniature

LEE

British automatic breaks through to low cost

Tom Shelley reports on state of the art in automatic transmissions for both conventional, hybrid and electric vehicles.

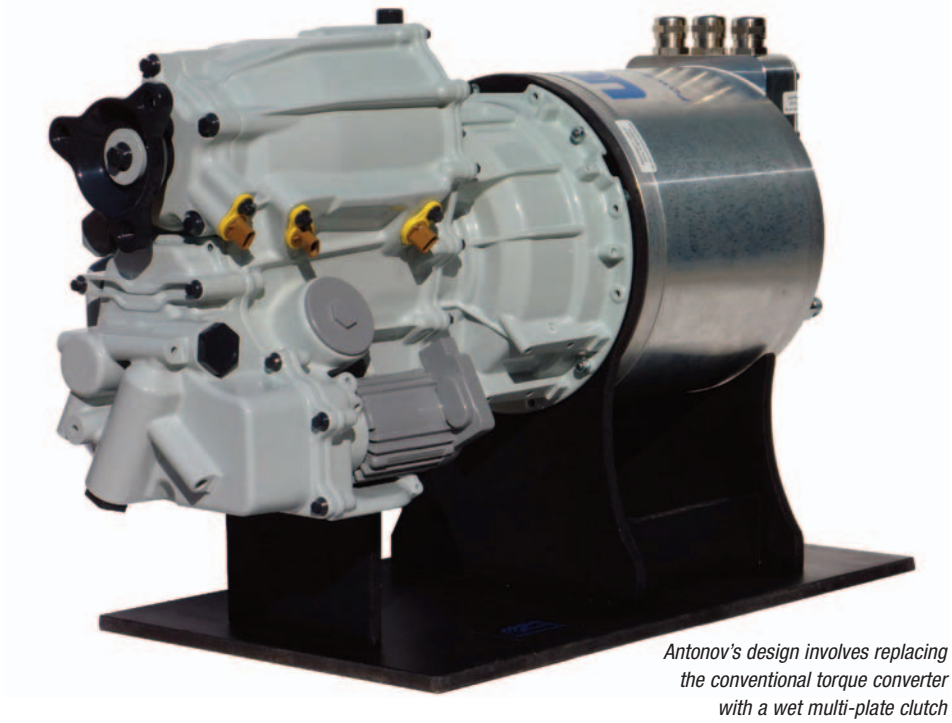
After 15 years' effort in developing and marketing its patented designs for automatic transmissions, Antonov has finally secured a deal with a Chinese company, Chongqing Landai Industry Co, in which the two companies have set up a 50:50 venture to build and operate a new factory that will initially produce 200,000 units per year.

The gearbox to be made there is the TX-6, a six speed unit capable of smoothly delivering 175 Nm of torque.

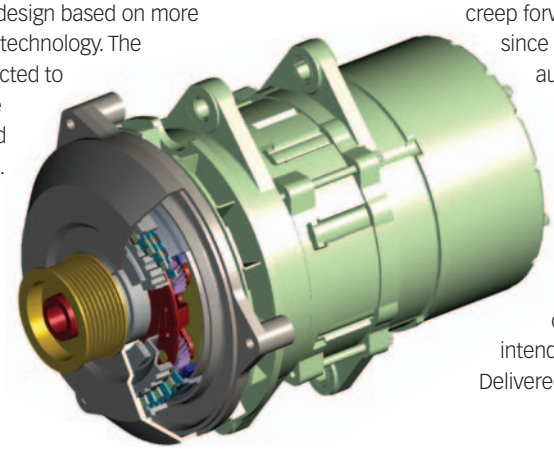
The design involves replacing the conventional torque converter with a wet multi-plate clutch. It uses two parallel shafts with three pairs of transfer gears, four epicyclic gear sets and various hydraulically actuated brakes and clutches. These lock the different gear combinations together to achieve the six gear ratios and reverse (with what Antonov chief operating officer Simon Roberts describes as 'direct drives') when epicyclic combinations are locked together in fourth, fifth and sixth gears. The complexity arises, because, as Roberts explains: "We focus each of our gear ratios to give the best efficiency."

Despite the number of parts, it is less expensive to manufacture than more conventional automatic gearboxes. It is also shorter, being only 325mm long, as opposed to 380 to 480mm for a design based on more conventional design technology. The torque rating is expected to go higher with future design iterations, and the units weigh 78kg. A future variant is planned that will deliver 375Nm of torque.

The gearbox has been tried and tested in a Volkswagen Golf, which has completed 75,000 km so far without failure. We took the opportunity to drive this vehicle on both urban and rural roads, and despite our best efforts, we were unable to make it produce either jerks or unpleasant noises. It has been given the ability to creep forward after stopping, since drivers of cars with automatic transmissions have come to expect this. So far, six demonstrator gearboxes, have been built in the UK and put into cars, out of an intended total of 10. Delivered cost in China is expected to be around €1,000, and it is to be used in cars such as those made by Lifan Motors, which sell for around €7,000. It has a 1.6 litre engine and a 155 Nm torque requirement, well within the capability of the current TF-6. It is expected that 17 million new cars will have been sold in China by the end of 2010, double the figure for 2007.



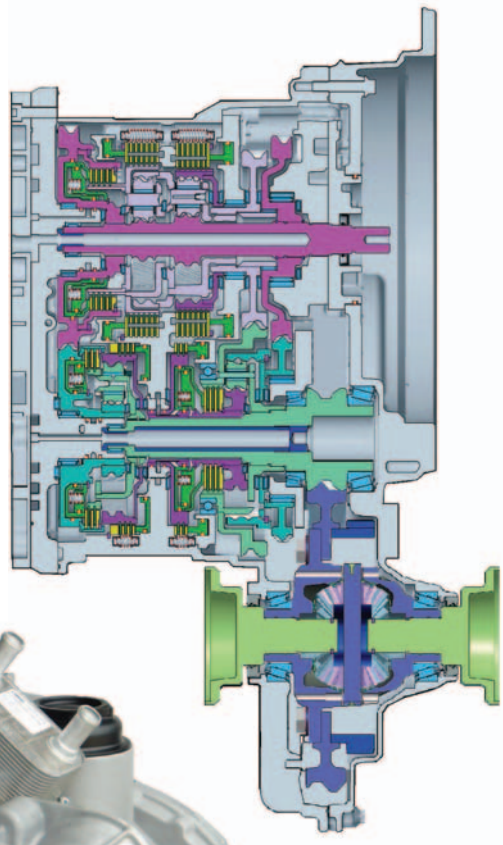
Antonov's design involves replacing the conventional torque converter with a wet multi-plate clutch

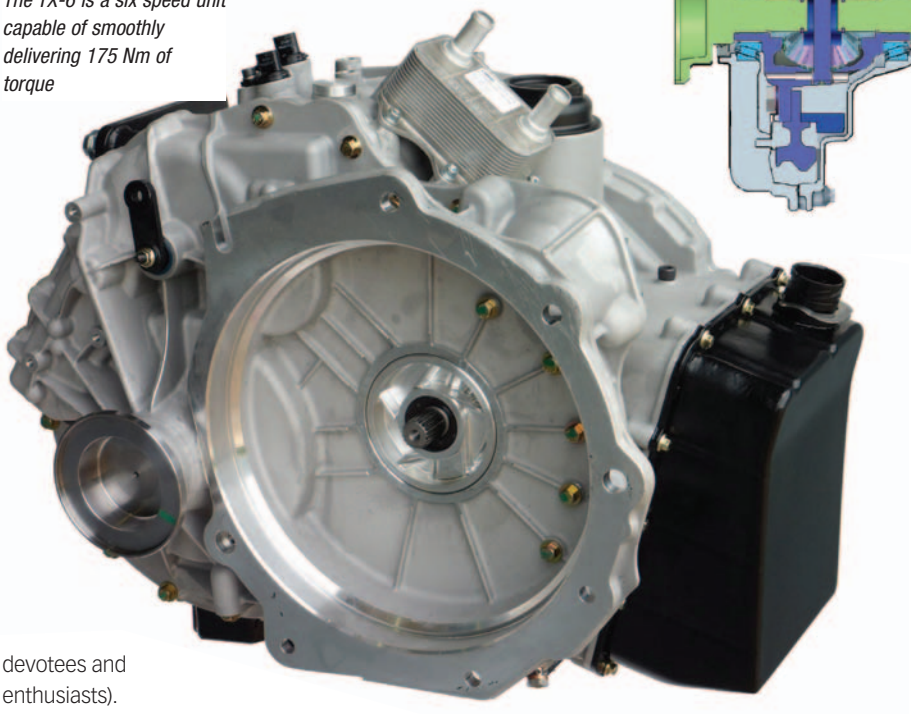


One of the reasons for targeting the gearbox at the Chinese market is their cars have less sophisticated engine management systems. A particularly sophisticated engine management system and CANbus is required to allow the use of dual clutch transmissions (see Eureka, March 2009), the solution favoured by many European car designers. As the gearbox changes up, it is necessary to reduce the engine speed so that a gear change can be made quickly as well as smoothly. The TX-6 gets over this problem by

temporarily absorbing the speed differences in its wet clutches. DCTs are also significantly more expensive to manufacture and could be expected to cost €1,400 to €1,600.

Possible alternative strategies for automatic transmissions that approach or exceed the efficiencies of manual boxes include variable ratio belt drives, widely used in small garden tractors, snowmobiles and motor scooters. This system, first installed in the British designed and developed Clyno car in 1923, is still around, but is currently out of favour with most car makers ever since the 'Variomatic', which was introduced on DAF cars in The Netherlands in 1958 and was hated by most of its users (although it still has its devotees and enthusiasts).





The TX-6 is a six speed unit capable of smoothly delivering 175 Nm of torque

Then there is Torotrak, another British invention, dating back to the 1970s. It has found commercial applications, ranging from the Harrier jump jet and the F1 KERS – Kinetic Energy Recovery System, to ride on lawn mowers, but it has never found favour with mainstream car manufacturers, who have instead looked to better automatic gearboxes based on gears.

Although the Antonov TF-6 is to be a made in China as a product for Chinese customers, quality is considered to be a paramount requirement and 20% to 25% of the components will be sourced in Europe, at least to begin with. In particular, hydraulic blocks which have to manufactured to 'high tolerances' are likely to be made in Germany.

The fortunes of Antonov appear to have been greatly transformed since the appointment of Dr Jos Haag as executive chairman about 18 months ago. Apart from the China deal, whose licensing agreement, signed in February 2010 is worth €20m, the company has diversified into other products and consultancy. Projects such as the two speed supercharger have been abandoned as a 'solution to a problem that did not exist'.

Antonov is now involved in the development and production of transmissions for luxury market hybrid and electric cars and also a gearbox that will allow military vehicles to run alternators at full speed, even when their engines are running at idle speeds, in order to power growing volumes of electrical and electronic systems. The company is, additionally 'in discussions with a US West Coast manufacturer of electric vehicles'.

Antonov's Roberts is a strong believer in gearboxes for electrically-driven vehicles, pointing out that, in the LimoGreen project, spearheaded by Jaguar, first studies showed that if the car was to be driven directly by a single motor, the 900Nm torque requirement led to a need to supply it with up to 1200A. Inserting a three speed gearbox reduces the need for motor torque to 450 Nm and the current requirement to 400A to 500A. The solution of a smaller motor and gearbox is also lighter, less expensive and fits the space in a Jaguar normally occupied by the conventional transmission. Two gears would solve the problem, but Roberts said this involved 'too big a step'; because of possible jolts, inertias, and requirements for durability, at least three gears is better. He said that first prototypes for the next stage of the project would be built in December, to go into LimoGreen demonstrator cars in January 2011. The company is also expecting to produce gearbox-equipped motors that are 'likely to go into 100 buses to be used in a certain sporting event in 2012', and 'could be ready for series production in 2013'. The gearbox was described as being: "Effectively a three speed DCT, but launched with motor and clutch engaged." A transverse variant has also been designed.

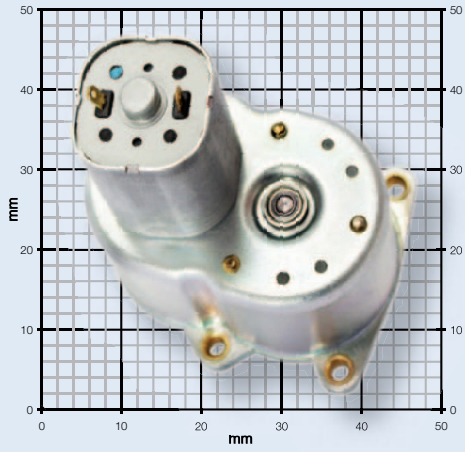
www.antonovplc.com
http://torotrak.com

Design Pointers

- Antonov's six speed transmission with dual shafts and its multiplicity of epicyclic gears is the ideal solution for a new generation of Chinese cars being better value for money than alternatives
- Geared automatic transmissions with no torque converter are much more fuel efficient than those that have one
- The company is firmly convinced that electrically driven vehicles perform better with more cost efficient transmissions if there is a gearbox between the motor and the wheels. Three speeds seems to be the preferred configuration at present

2010 catalogue
now on line

So, what's new?



210 gearbox driven by a rare earth brushed motor delivering an exceptional torque/speed curve.

That's what's new.

www.rotalink.com
+44 (0)1460 72000

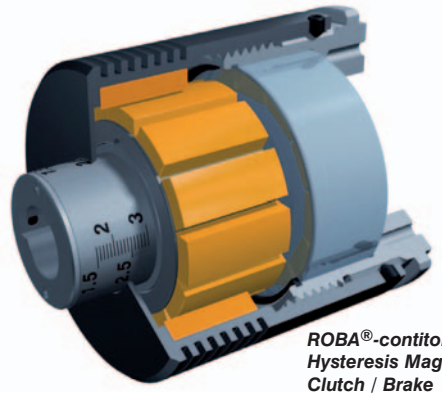
Call or visit our web-site to find out about this revolutionary concept produced with engineers in mind.

Rotalink
Miniature Motors, Transmission and Control

---

mayr® power transmission

"Continuous Slip – Zero Wear"



ROBA®-contitorque Hysteresis Magnetic Clutch / Brake

Benefits

- Contactless Torque Limitation
- Wear / Maintenance Free
- Accurate Torque Repetition
- Load Holding Capability
- Low Weight / MMI
- Simple to Adjust

Applications

- Capping / Closing
- Tensioning of Foil, Wire etc.
- Polishing Spindles
- Railway Point Machines
- Reeling Machines
- General Overload Protection

www.mayr.co.uk

Mayr Transmissions Ltd.
Valley Road Business Park,
Keighley, West Yorkshire, BD21 4LZ
T: 01535 663900 F: 01535 663261
E: sales@mayr.co.uk

Quality, Precision and Reliability

Due to the recent purchase of an Inova Gear inspection machine, Ondrives are now capable of offering expertise within the gear and power transmission markets, that has previously only been available in the high end aerospace industry. We are dedicated to ensuring our customers receive quality products to the highest industry standards.

Tel: +44 (0)1246 455500 Fax: +44 (0)1246 455522
sales@ondrives.com www.ondrives.com
Free Catalogue Available on Request

Plastics get greener

Tom Shelley reports on some of the plastic innovations that were revealed at this year's 'K' show.

A significant number of exhibitors offering biopolymers and other 'green' or greener products was apparent at this year's 'K' – Kunstoffe – show, held from October 27th to November 3rd.

At the same time, all the usual exhibitors were there with new blends and new applications for their products that push forward what is considered possible and likely to become the norm, particularly in the automotive sector, where potentially large orders continue to make it an important market for all major players.

The two driving forces to introducing more plastics into cars are to save weight and reduce manufacturing costs. Both goals are achieved in a complete, single part tailgate that has been developed by Bayer MaterialScience. Whereas a conventional tailgate is made of metal with an inserted glass window, the new part has a single seamless skin made of coated polycarbonate (PC). Non transparent areas are either back printed in a dark colour or back injected with a black frame material by two component injection moulding. A rear spoiler and two styling lines are directly moulded in. Tail lamps, indicators, brake lights, license plate lights and the raised brake light are located behind the skin, so there is no need to seal lenses to bodywork. Fixings and guides can be directly integrated by the two-component back injection method. The license plate would also be behind the skin, deterring thieves. It would also be quite conceivable, according to Volkhard Krause, head of the company's automotive glazing team, to integrate parts of the water management system. Instead of separately mounted locks and door handles, light sensors could be installed behind the skin for opening and closing the tailgate.

The only problem is that, on its own, a PC skin would not be stiff enough to meet load specifications. In order to remedy this, strips of sheet metal are inserted in grooves between the ribs and bonded with an adhesive that is sufficiently elastic to accommodate the difference in thermal expansion coefficients. The metal inserts additionally ease the attachment of locks, hinges and dampers, to allow the tail gate to be attached to the rest of the vehicle body. Despite this added metal, Krause estimates that overall weight saving over a conventional part is 30 to 40%.

Lanxess, the other half of what was formerly Bayer on the Leverkusen site, has also been involved in successfully applying metal plastic hybrid technology – this time to the front end of the Audi A8. To make it, semi finished 'Tepex' 'organic' sheet, made of woven glass roving in a plastic matrix, is supplied by Bond-Laminates in Brilon, Germany and formed to shape. It is then placed in an injection mould along with three aluminium sheets and over moulded in Lanxess 30% glass 'Durathan BKV 30 EF' PA (polyamide) to form reinforcements and ribbing.

The resulting structure incorporates a double torsion ring that significantly increases the stiffness of the front end of a vehicle. In the event of a head on collision, the resulting forces are distributed across three load planes and four load paths. The final part is 20% lighter than if it had been made out of aluminium alloy alone.

Seats too, can be made lighter using plastics, as was demonstrated by a new seat concept called the 'Susco 1.5' – an abbreviation of 'sustainable comfort'. It has been developed by three partners: BASF, which came up with a special 'Ultramid' PA for the project; Faurecia in France; and Performance Materials Corporation in California. It is made up from layers of continuous fibre reinforced plastic, over moulded with 'Ultramid' in a second step, and weighs 20% less than conventional car seats while being 30mm thinner. Serial production is expected to start in four years time.

Bioplastics

The French company Roquette chose 'K' to launch a range of plastics named 'Gaïalene', based on its 75 years of experience with processing starch. Michelle Serpelloni, Roquette's Gaïahub programme director, said: "Our resin transforms like thermoplastics but at a lower temperature, about 170°C. This requires less energy during transformation and improves the overall carbon footprint."

The range, said to offer to offer characteristics such as shock resistance, softness and easy colouring and compounding, is aimed at applications presently using polyolefins, ABS (acrylonitrile butadiene styrene) and 'more technical polymers'.

This single-part tailgate from Bayer MaterialScience has a single seamless skin made of coated polycarbonate

FKuR Kunstoff, on the other hand, was offering 'Bio-Flex S 5630' based on PLA – polylactic acid and PBS – polybutylenes succinate which are both 100% biodegradable. Heat distortion temperature is 105°C. The company works closely with the Fraunhofer Institute UMSICHT and also offers 'Biograde', a cellulose ester compound and 'Fibrolon' natural fibre reinforced polymers.

Bioresins.eu is a UK based company distributing 'Ecomann' PHA (polyhydroxyalkanonate) made by Shenshen Ecomann Biotechnology in China, as well as TPS, thermoplastic starch and PLA, all of which are biodegradable and compostable. The PHA is made from maize starch and may be processed similarly to PE – polyethylene, but at lower temperatures.

Not particularly biodegradable, but with somewhat higher performance, is 'Arnitel' Eco, a thermoplastic copolyester (TPC) from DSM which is 20% to 50% derived from rapeseed oil. The product is said to show exceptional resistance against UV light and long term heat.

Design Pointers

- A whole car tailgate has been moulded in plastic that does away with the need for separate glazing or light covers
- Significant weight savings can be achieved in high impact absorbing constructions combining rove glass mats, injection moulding and metal sheets
- The number and variety of biopolymers is increasing. Most offer biodegradability or compostability as their main attraction but some offer lower processing costs and enhanced performance
- Environmental benefits can also be achieved by improving or taking advantage of the performance of more traditional polymers

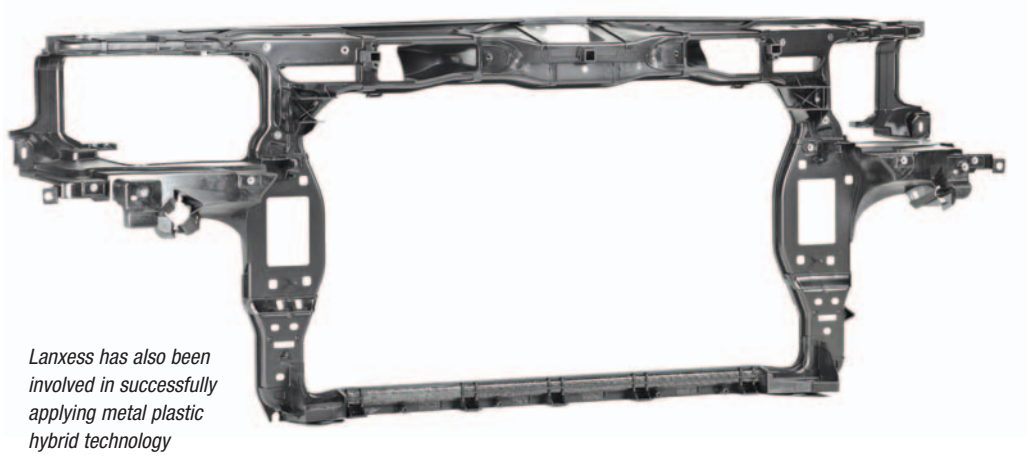
Plastics for new challenges

New engineering developments often require new thinking in materials. For example, robotics are mostly made in metal, but Hybrid Assistive Limbs (HAL) to help the elderly and partially disabled walk, stand up and climb stairs are best made out of plastic, according to Professor Yoshiyuki Sankai, CEO and founder of the Japanese company Cyberdyne. Exoskeleton elements are strapped onto human limbs and controlled via a computer that receives bioelectric signals from electrodes attached to the human skin. "Bayblend improves the functionality considerably," Professor Sankai commented. It said that a HAL system can produce almost ten times the power available from muscles, and could be used to assist physical tasks in industry, as well as military situations, as has been featured in countless science fiction stories and films. 'Bayblend' is the name used by Bayer MaterialScience for its range of amorphous thermoplastic polymer blends based on PC and ABS as well as rubber modified PC and styrene-acrylonitrile copolymer (SAN) blends.

Another challenge area is protecting the electrics of photovoltaic systems because these have to be used outdoors and endure wet weather and a high temperature range. For this purpose, BASF is offering special variants of its 'Ultramid' PA products that are at the same time, strong, flame resistant and show high impact resistance and low temperatures.

New insulating foams can also do much to reduce carbon emissions, as well as costs, by improving thermal insulation in a wide variety of products including domestic and industrial refrigerators.

Bayer Material Science is developing rigid PU (polyurethane) nanofoams which are to have pore sizes of the order of 150nm across instead of the 150µm that is typical at present. The company is working with Prof Reinhard Strey from the University of Cologne's Institute of Physical Chemistry which has applied for a patent on a process called POSME – Principle Of Supercritical Microemulsion Expansion – to produce them. Commercial production, however, is thought to be 'several more years' away. At the same time, competitors, BASF offers insulating foams designated 'Neopor' (EPS, expandable polystyrene), 'Styrodur C' (XPS, extruded polystyrene) 'Elastoper H' and 'Elastopir' (rigid PU), 'Ultradur' (PBT – polybutylene terephthalate and 'Ultramid' (PA).



Lanxess has also been involved in successfully applying metal plastic hybrid technology

www.bayermaterialscience.com
www.lanxess.com
www.bond-laminates.com/en.html
www.basf.com
www.faurecia.com
www.roquette.com
www.fkur.com
www.bioresins.eu
www.dsm.com
www.cyberdyne.jp/english

READER INTERVIEW

IAN COLVILL
R&D ENGINEER
GE SENSING

60 SECOND

Q How did you get into engineering?

A It's all I've ever wanted to do since I was a kid at school basically. There was a family connection in that my dad had an engineering shop, so it really just felt like the natural thing to do. So I began work as a trainee pretty much as soon as I left school.

Q How did you find yourself in your current position?

A If I'm honest, I sort of fell into it. I had lost a job previously and was running a business doing duct fitting at the time and a temporary position as an R&D technician opened up here. I came here to do that and here I still am, ten years later.

Q What does your current role involve?

A Prototyping, basically. For the industrial, automotive and aerospace sectors – anything that needs a sensor.

Q What have been the most interesting projects you have worked on?

A Probably some of the aerospace ones, if I'm honest, but I can't really talk about the most interesting ones as they were for the military.

Q How has the industry changed since you first started?

A Well, the fact that everything comes down to the bottom line isn't exactly a change, but it does seem to have become more dominant. But beyond that, I'd probably say that the biggest change is that there don't seem to be as many people wanting to do this type of job as there used to be. There doesn't seem to be the desire to get their hands dirty anymore.

Of course, computers have played a big part in that and they have made a huge difference to the way we work. I learned the old-fashioned way with a pencil and a piece of paper, but now CAD has just swept all that away and made things so much easier. I actually taught myself how to use SolidWorks years ago and it's revolutionised everything. There are no drawing offices anymore, just seats of CAD.

While I do think CAD has been a positive thing generally, I do believe that having the old-fashioned skills of technical drawing is still a useful thing. After all, you never know when there might be a 'brownout'!

Q What do you think is the biggest issue facing industry?

A Getting young people interested in engineering. The teaching at school now where they do design and technology, but they don't teach engineering anymore. I find that highly disturbing, really. And there are fewer and fewer kids interested in it now. Where we had Meccano and Mamod Steam Engines, now they have computers. You ask a child now what a Mamod Steam Engine looks like and they wouldn't have a clue.

It's about finding the right way to excite their interest these days and I think computers have taken a lot of that away. Even though I'm a bit of a computer geek myself now, I can see the damage that they might be doing in terms of future engineers.

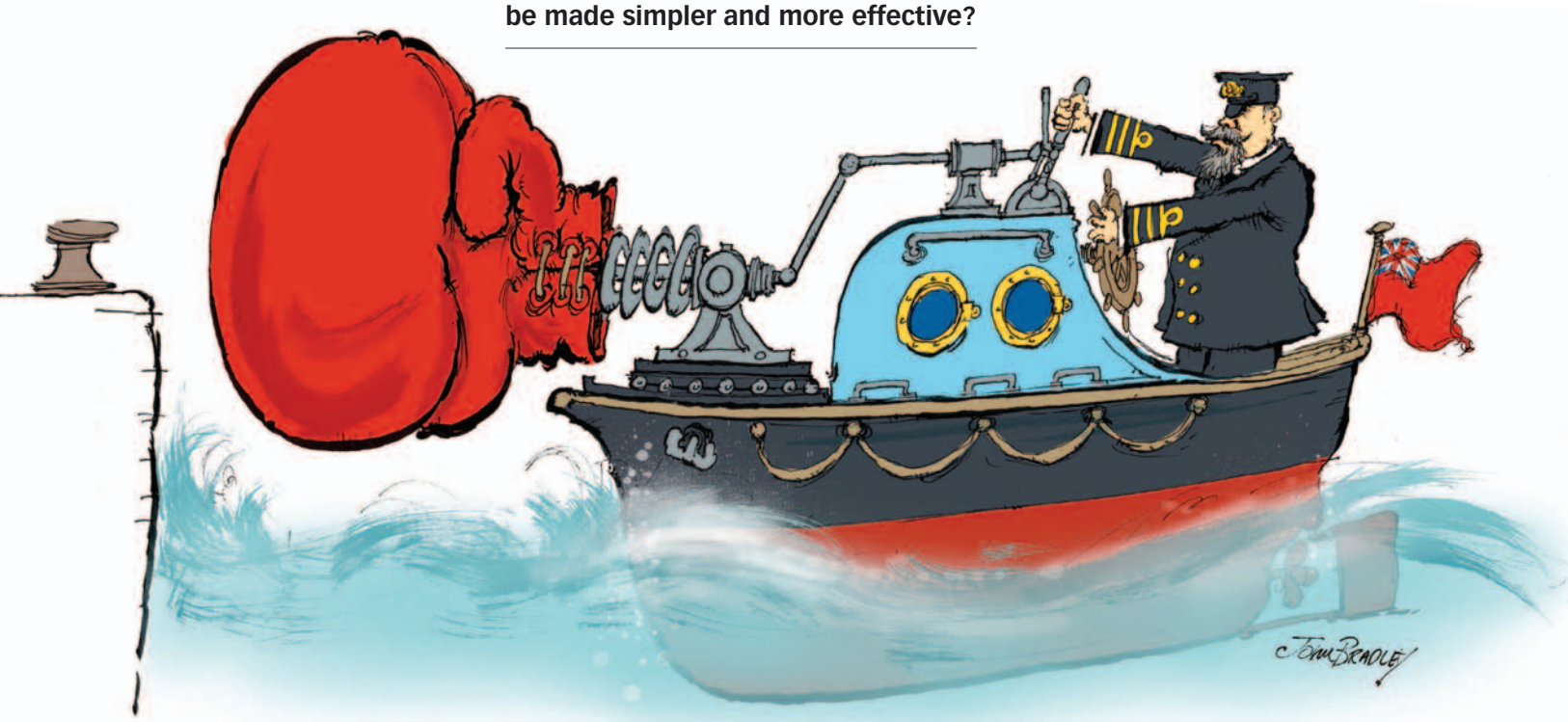
That's definitely one of the big problems going forward. I don't deal with recruitment here and I don't think we recruit anyone under degree grade anyway, but I can see that it's a big problem and I believe that in the future we'll pay the price for it.

Q What still excites you about engineering?

A Just about everything. Everything that excited me about it when I was a kid still excites me now. It's all about being hands-on. All the machining, the designing – it's all about the challenge. And the thing I find is that, the more technology advances, the greater my desire to try and find the simpler route. Rather than going the high-tech route, I want to go the other way. Everyone wants to go high-tech this high tech that, but sometimes it doesn't hurt to go back to low-tech.

Crashing boats

How can collision prevention in boats be made simpler and more effective?



Those of our readers with small boats will be well aware of the need for fenders – air filled cushions, usually sausage-shaped, which are hung over the side to prevent damage either when encountering other boats, or more commonly, harbour walls, jetties and dock sides.

These devices are normally tied to the side of the boat, often to rails running round the sides to help prevent users falling in when performing necessary tasks. Boating on the open sea or river, whether powered by sails or engine, is relatively easy compared to coming in with one's white painted, fragile hull to moor to a hard jetty against the effects of wind, tide and current. Jetties often have projecting iron work and one of the tasks of whoever is on the bows of the boat is make sure that the fenders are at the right height to absorb an impact. This height is often hard to judge until very shortly before impact. Most pleasure boats are navigated by husbands and wives, and divorce is a distinct possibility if a row results as to whose fault it was if the precious vessel makes a direct crunch against a hard object.

The usual solution is to undo the ropes on at least two fenders, and hold them by hand so they can be lowered to the right position as impact occurs, and then tie them back in place. This requires rapid dexterity, never an easy task on rough water in windy weather. The alternative is to have rather a lot of fenders at different heights, but this not only looks unsightly but invites ridicule from other boaters.

The Challenge

Our challenge this month is to come up with a method of making sure that fenders are at the right height when a boat is brought into moor. It would in theory be possible to devise something based on laser stripe sensing to determine the profile of the approaching dockside, coupled to a suitable programmed microcontroller and electric winches on the ropes supporting the fenders. Apart from being expensive, the chances of such a system continuing to work in a marine situation, particularly on a boat used only for occasional weekend trips is low.

The solution we offer in the January edition of our magazine has to be a preferred solution because it is so much simpler, cheaper and more reliable.

See if you can come up with something better.

The answer to last month's Coffee Time Challenge of how to design a door-closing device can be found on our Technology Briefs section on page 8.

EUREKAJOBS

Online CV | Jobs by email | Recruiter Services

LOOKING TO RECRUIT? CALL US NOW ON 01322 626995

CONSULTANCIES IN THIS SECTOR

T: 01234 436136
E: post@vrl.co.uk
www.vrl.co.uk

Vector -the High Technology Specialists. We are all Engineers and we find jobs for Engineers. We speak your language, we understand your needs and we get it right. Whether you are job hunting or recruiting staff for your company, talk to the experts!

T: 0800 929 114
E: permrec@kinetic-selection.co.uk
www.kinetic-selection.co.uk

Established in 1983, Kinetic Search & Selection exists to meet the permanent recruitment demands of both businesses and candidates based in the Engineering, Manufacturing and Technical industries.

T: 07717 755149
E: dave@teksource.eu
www.teksource.eu

Focussing on commercial and engineering recruitment throughout technology markets, Teksource is dedicated and well placed to fulfil your requirements.

T: +44 23 9248 8500
E: havant@parc-group.com
www.parc-group.com

As one of the longest established and most professional recruitment and staffing providers in Britain and Ireland, our reputation is key to us at Parc Recruitment. So placing you first is something we believe in and practice.

T: 01268 245000
E: recruitment@arrkeurope.com
www.arrkeurope.com

ARRK are specialists in the provision of in house Design and Engineering services. Our Recruitment Division has over 20 years experience supplying both contract and permanent labour in the Product Design, Engineering, Manufacturing, Renewable Energy and Quality fields.

T: 02476 555 000
E: matt.peedle@premiere-agency.com
www.premierepeople.com

We have the skill base to satisfy all of your Engineering requirements. Premiere People have a database of high calibre Engineers for Contract and Permanent positions with a wide range of experience located throughout the UK.

T: 01296 330930
E: info@morganrem.com
www.morganrem.com

Morgan REM. The Original Manufacturing & Engineering Industry Recruitment Company.
Over 20 years' experience means Morgan REM can help you find the right candidates... or the right career move.

Mechanical Engineers

Eastern (Cambridgeshire)
Attractive Salary Package

We are now seeking very well-qualified Mechanical Engineers to join this well respected Product, Process Design and Development Consultancy based near Cambridge.

Working in a highly creative, technical environment, you will have a leading role in contributing to solutions on a wide variety of challenging projects, from the initial concept and analytical stages through to prototype delivery and manufacturing introduction.

The successful applicant will have a 1st or 2:1 from a leading university in Mechanical Engineering and ideally experience in one of the company's principal industry sectors (Energy, Packaging, Healthcare and Medical, Food and dispense, Consumer, Industrial), gained either in industry or in a consultancy. You should have strong creativity with a good understanding of engineering principles. You will have the ability to lead or contribute to multi-disciplinary teams working in a wide range of technical disciplines and be able to deliver demanding projects to high quality, on time and on budget. You must have excellent communication skills and be self-motivated, comfortable with presenting your work and ideas to clients.

You will have the ability to lead or contribute to those aspects of projects which cover the analytical, creative and development aspects of mechanics, fluids, thermodynamics, control engineering, structures and design for manufacture. In this role you will manage the activities of associates and sub-contractors, as well as manage projects. You will also assist with sales activities in growing their business i.e. by contributing to and writing proposals or thought pieces for prospects and attending sales meetings.

For full details and to apply for this job go to www.EurekaJobs.co.uk and type in reference: 328581

Design & Development Engineer

Location: North West (Greater Manchester) Salary: £24,000 - £30,000

Reporting in to the Head of R&D your main job purpose will be to design, develop and test new products for both the off-road/road motorcycle and cycle markets.

Your key responsibilities will be to:

- Progress new product development including the design, development & testing of new & existing products from prototype stage to final production
- Design products utilizing Solidworks and ensure designs are fit for purpose, meet cost targets & meet all regulatory requirements
- Perform stress analysis via FEA on necessary products to ensure designs meet strength requirements
- Plan, define & execute all testing as needed to prove designs are fit for purpose
- Liaise with suppliers as needed on component design to produce cost effective & quality products
- Assist in the development of manufacturing methods if manufactured internally including equipment required, CNC programming, fixture design & tooling requirements
- Work in researching & initiating new ideas for innovative products and improving existing products
- Provide Technical support to the factory as needed
- Attend weekly R&D meetings to update the team as necessary on status of projects

You should have a...

- Degree in Mechanical or Automotive Engineering
- Good level of experience in a product development engineering role.
- Good knowledge of a wide range of manufacturing techniques and methods for aluminium & steel plus some metallurgical knowledge.
- Experience performing FEA & utilizing GD&T.
- Working knowledge of Microsoft Office applications & Solidworks.
- Ability to manage multiple projects & work on own initiative in a fast paced environment.

For full details and to apply for this job go to www.EurekaJobs.co.uk and type in reference: 328667

3D printing and rapid manufacturing

The Fortus 400mc

The Fortus 400mc supplied by Laser Lines has been in use continuously on the Gordon Murray Design T.25 City Car for both prototyping and manufacturing.

Outperforming original expectations, Murray explains: "We initially used the machine as a design tool but soon discovered we could use it more and more for structural parts. In fact, we've designed the entire of the T.25 interior using the machine – including instrument panel, sun visor, internal mirrors and internal trim. We expect to be able to do the same with our next project, the T.27."

@: info@laserlines.co.uk
✆: 01295 672500

www.laserlines.co.uk

Adhesives

Adhesives become more user friendly

Loctite 2400 and Loctite 2700 are two new threadlocking adhesives that meet stringent Health and Safety requirements.

Both medium-strength Loctite 2400 and high-strength Loctite 2700 have qualified for a "white" Material Safety Data Sheet. This means according to the tough EC Regulations neither adhesive carries hazard symbols, risk or safety phrases. Also, they do not contain any declarable carcinogenic, mutagenic and reproductive toxins.

While breaking new ground, the traditional high performance of Loctite brand threadlockers has not been compromised.

Once cured, both products offer excellent resistance against most industrial chemicals, and achieve good thermal resistance.

@: technicalservice.loctite@uk.henkel.com
✆: 01442 278100

www.loctitesolutions.com

Adhesive Tapes

For help and technical advice on our range of double sided, cloth and masking tapes or converted products please phone 01908 500235 for your nearest authorised tesa distributor

tesa AG
A Beiersdorf Company

tesa UK Ltd
Yeomans Drive Blakelands Milton Keynes MK14 5LS
tel: 01908 500235

think tesa

www.tesa.co.uk

Cameras

GigE Vision Capability For Sony FCB E Series Camera Range

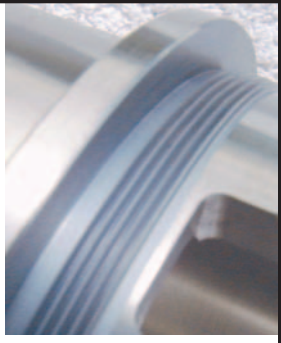
GigE Vision and GeniCam standards committee member, STEMMER IMAGING, is delighted to be able to announce the versatile performance of the new Sony FCB E Series of colour block cameras with GigE Vision and GeniCam functionality. The new CVC GE family includes a camera equipped with an FGI GigE Vision-compliant interface board produced by STEMMER IMAGING and the CVB CameraSuite software development kit. The CVC-1020P GE was demonstrated for the first time at the Vision Show in Stuttgart, Germany, 9-11 November, 2010 and will be available for shipment early in 2011.

@: sales@stemmer-imaging.co.uk
✆: +44 (0)1252 780000

www.stemmer-imaging.co.uk

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!

@: sales@ws2.co.uk
✆: 01430 861222

www.ws2.co.uk

Dew-point meters

High-speed portable dew-point meter

Michell Instruments' MDM300 Advanced Dew-Point Hygrometer gives fast, accurate measurements – even to dew-points as low as -70°C. Reducing the waiting time gives you more measurements per day and more time to get on with your job.

Convenient to use: the MDM300 is small and light – easily held and operated at the same time. 'Plug and play' – works straight from the box: with built-in datalogging as standard and an intuitive menu system, you can start to use the MDM300 right away without needing to purchase hidden extras or spend hours training staff to use it.

Request a free, no obligation site survey of your compressed air system and see the MDM300 at work.

@: uk.info@michell.com
✆: +44(0)1353 658 000

www.michell.com

Electric Atomisers

Fine Droplets without High Pressure

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

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

Applications include:

- Humidification and Evaporative cooling
- Gas scrubbing and Odour control
- Dust suppression
- Oil misting.

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

@: newland.design@btconnect.com
✆: 01524 733 424

www.newlanddesign.com

Gears

DAVALL GEARS
www.davall.co.uk

Gears made to order?

Gears from stock?

Two questions, one answer
- Davall

When you require gears telephone:

Made to order - Davall Gears - 01707 283100

Stock - Davall Stock Gears - 01707 283131

Travellers Lane, Welham Green, Hatfield, Herts AL9 7JB
Fax: +44 (0) 1707 283111 Email: info@davall.co.uk

www.davall.co.uk

Heating Systems

Instant heating system delivers limitless, energy efficient hot water for Fox's biscuits

Fox's Biscuits in Preston will never run out of hot water again, following the installation of an EasiHeat™ Engineered System from Spirax Sarco.

The factory decided to upgrade its hot water generation since the existing system of two, 1000-litre calorifiers couldn't keep up with demand from the site's cleaning operations, especially at weekends. "Although we are often producing at the weekend we don't usually have every line running, so that's when we wash absolutely everything," says Central Services Charge Hand Graham Walker. "The problem with calorifiers is that if you take out 500 litres you have to put 500 litres of cold water in and start heating that up again. It wasn't very efficient and we couldn't meet demand, causing delays in cleaning, and increasing our operating costs."

@: Natalie.Byrne@UK.SpiraxSarco.com
✆: 01242 521361

www.spiraxsarco.com/uk

Instrumentation

Ixthus Instrumentation

Non-Contact Position Measurement using inductive, capacitive, ultrasonic, fibre optic or laser technologies. Measurement ranges from 50µm to 500 metres, resolution to 0.01 nanometre, frequency response to 200KHz, all with excellent environmental protection.

Force and Torque Measurement, miniature and fatigue rated loadcells, strain gauged bolts and clevis pins. Custom designs to meet your exacting requirements. Vibration Monitoring with switches, sensors and instrumentation for power generation and offshore applications. Ixthus provide full technical support for design, installation and calibration to all areas of industry for R&D testing, quality control and production requirements.

@: john@ixthus.co.uk
✆: 01327 353437

www.ixthus.co.uk

Liquid Level Instruments

Wika Expand Liquid Level Instrument Range

Following WIKA's acquisition of KSR Kuebler Niveau-Messtechnik AG, (also incorporating Phoenix Messtechnik Gmbh); their market leading range of Magnetic Level Indicators (Bypass Level Gauges), Sight Glass Level Indicators, Magnetic Float Switches and Level Transmitters are now available exclusively through WIKA Instruments Ltd.

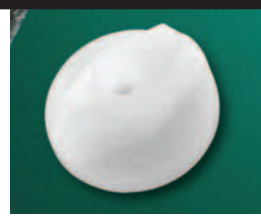
As a global leader in the provision of Pressure and Temperature Measurement Instrumentation, the addition of KSR Kuebler and Phoenix Liquid Level Measurement Instruments ensures WIKA continues to meet its customers' growing requirements for complete application coverage.

@: info@wika.co.uk
✆: 01737 644008

www.wika.co.uk

New Wing Nuts

Washer faced wing nut



BÜLTE washer faced wing nut is now included in the enlarged range of Bülte Plastics' fasteners.
It is the nut of choice where hand tightening is required.

Wing faced nuts need no tools thanks to the wings which allow manual tightening. The integral washer removes the need for a separate washer and reduces assembly time (even load distribution and surface protection).

BÜLTE washer faced wing nuts are available in M6 (other dimensions on request).
The thickness of the washer is 2 mm and the diameter 21 mm.

A catalogue will be sent to you free of charge on request.
Samples and prices available on request.

@: sales@bulteplastics.co.uk
✆: 01789 263 753

www.bulte.com

Quick-Disconnects

Harsh Environment Quick Disconnects speed Engine Test Hook-up

Chell's SQDC pneumatic quick disconnects, designed to speed up gas turbine data acquisition, are fully tested from -50 to 325 degC and for vibration to D0160F. Available in 16 and 19 way circular configurations for 1/16 inch diameter tubulation, SQDC's may be specified with Silicon or Perlast seals, pressure-tight blanks and pipework guides.

Chell also manufacture the Cablerange AS quick-disconnects for the Pressure Systems 9116 pressure scanner and Circlex quick disconnects for 1/16 and 1/8" diameter tubulations for multiple connections up to 30 ways.

Although designed for turbo-machinery testing, Chell quick-disconnects are equally ideal for any test stand application where multiple pressures are being measured.

@: info@chell.co.uk
✆: 01692 500555

www.chell.co.uk

Sensors/Switches

Pressure level temperature and flow

Applications Engineering Ltd holds a comprehensive range of pressure, vacuum, level and flow switches. We provide 'tailor made', custom designed products, accessories and associated product lines including the Jetcleaner hose and pipe cleaning system.

We offer a 30 day sale or return sample service on our standard products. That way, you only buy when you are satisfied that the product suits your application.

More often than not, we are able to get a product to you within 24 hours of you making your first enquiry.

@: info@appeng.co.uk
✆: 01825 764737

www.appeng.co.uk

Stainless Steel Fasteners

New range of A2 & A4 Stainless Steel Fasteners

Plastic and metal fastener distributor Anixter Component Solutions has launched a new range of metric Stainless Steel male and female threaded fasteners in both A2 and A4 grades; ideal for applications where enhanced corrosion resistance is paramount.

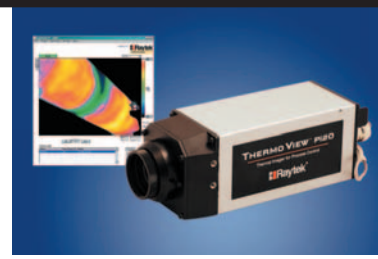
The range covers popular drive styles including Slotted, Pozi and hexagon socket, as well as Tamper Torx® drive for tamper proof fixing. Head styles include Hexagon, Pan, Countersunk, Button and Cap head. Stainless steel threaded rod (Allthread) is also available in sizes from M3 to M20. This can be supplied in standard 1 metre lengths or cut to suit the customer's requirements. Female fastener styles available include Hexagon, Dome, Wing & Self-Locking nuts and Flat, Shake-proof and Spring Washers.

@: andrew.fletcher@anixtercomponents.com
✆: 01202 865222

www.anixtercomponents.com

Thermal Imaging

Raytek® Introduces ThermoView™ Pi20 & DataTemp® Pi Process Imaging Solution



Simplified thermal imaging expands real-time view of industrial process performance.

August 2010 — Raytek®, a leading worldwide provider of infrared (IR) thermometry and maker of the industry-leading ThermoView Ti30 infrared camera, has introduced the ThermoView™ Pi20 process imager and DataTemp® Pi (DTPi) software. This easy-to-use thermal imaging solution provides an expanded view of process performance in a wide range of industrial applications.

@: info@raytek.de
✆: 01908 370000

www.raytek.com

IMPACT20 - 16 inputs or outputs in one small space

IMPACT20 is the new fieldbus I/O station from Murrelektronik! Thanks to a very small footprint and low height, IMPACT20 is perfectly suited for applications in terminal boxes and in control panels and other tight spaces.

IMPACT20 features:

- Predefined inputs and outputs.
- Port-related shutdown in case of failure.
- Diagnostic messages via the bus.
- Plug-in terminals with integrated LEDs for single channel diagnostics.
- CanOpen , DeviceNet, ProfiNet, EthernetIP, EtherCat, and Profibus.
- Input only, Output only and mixed modules.

Murrelektronik Ltd
5 Albion St, Pendlebury Ind.Estate,
Swinton, Manchester, GB
M27 4FG

Phone 0161 728 3133
www.murrelektronik.co.uk
sales@murrelektronik.co.uk

MURR ELEKTRONIK
stay connected