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POWER SOLVE

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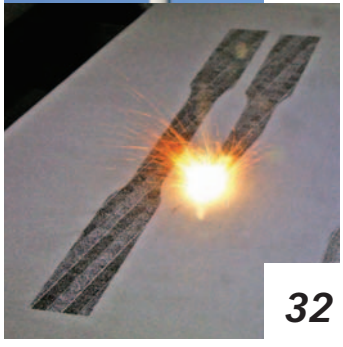

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Confocal measurement system

- Measuring ranges from 0.12 to 24mm
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Typical applications:

Measuring of glass and mirrored surfaces

Measurements inside bores and holes

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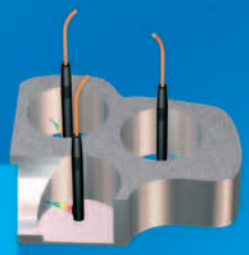


optoNCDT 2402
The world's first miniature sensor with just a 4mm outside diameter

Laser profile sensors

- Measuring ranges from 25 to 245mm
- Lightweight and compact sensors
- Very high measuring rate of 256kHz
- 3D view of the target
- Micrometre resolution

Typical applications:

Position and contour measurement, edge detection, web width, groove width / depth, welding seam inspection, welding robot control

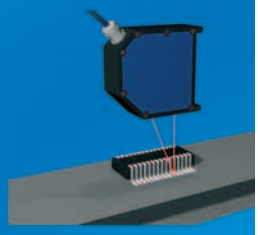
scanCONTROL 2700
Most compact design with integral controller

Laser triangulation sensors

- Measuring ranges from 2 to 1000mm
- Models with integrated controller
- From low-cost entry level models up to highest precision in class
- Analogue and digital interface
- In built synchronisation for thickness measurement

Typical applications:

High precision measurements in automation, positioningand in-process quality control



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optoNCDT 2220
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Shouldering the green burden

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

More by accident than design, the theme that comes across strongly in this month's issue is the environment. From the cover story looking at the whys and wherefores of design for end of life to a feature looking at the advances in drive and control technology being developed for the renewable sector, there can be little doubt that 'green' issues now dominate many people's working lives.

In this sense at least, the environmental debate has been over for some time. The 'big picture' politics and ideologies of the climate change question may rumble on, but from a practical, day-to-day point of view, there are few walks of life that have not already been transformed by questions relating – at least tangentially – to the environment.

Like most transformations, it has been gradual. Many of the changes have been imposed by regulation, which has allowed time to adjust, while others – like saving energy in a world where fuel costs are rising – just make sound business sense. However, that such changes have often been more a question of pragmatism than principle should not distract from how significant they have been.

Naturally, this emphasis has placed a huge burden on the shoulders of the design engineer as he or she has had to negotiate the minefield of environmental regulation while still achieving cost savings and greater efficiencies.

The work is very far from being finished, of course. If there is one factor driving design innovation in the modern world more than any other, it is the environment. To achieve a successful result, the skills of engineers will be called on again and again. So, next time you wonder whether your contribution is sufficiently valued, it's perhaps worth bearing in mind that you are on the front line of probably the most significant societal shift we will see in our lifetimes.

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

Briefs

FINAL CALL TO ENTER MX AWARDS

Engineering firms across the country have a final chance to enter the Institution of Mechanical Engineers'(IMechE) Manufacturing Excellence Awards (MX) 2010.

MX is free for any firm to enter and is the only best practice benchmarking scheme of its kind to offer an elite panel of industry experts giving up to £20,000 worth of free, impartial advice. Within the MX scheme, SMEs can receive coaching and support from leading industry experts such as the Manufacturing Advisory Service (MAS).

www.mxawards.org

SHORT COURSES LAUNCHED FOR INDUSTRY PROFESSIONALS

Bournemouth University has launched 22 short courses to provide professional development for product designers and engineers.

The courses, which start between May and August, range from computer-aided design, tribology, dynamic design verification and structural integrity in design, to understanding and designing against corrosion, using simulation for competitive advantage, and advance mechanics of materials and interacting systems.

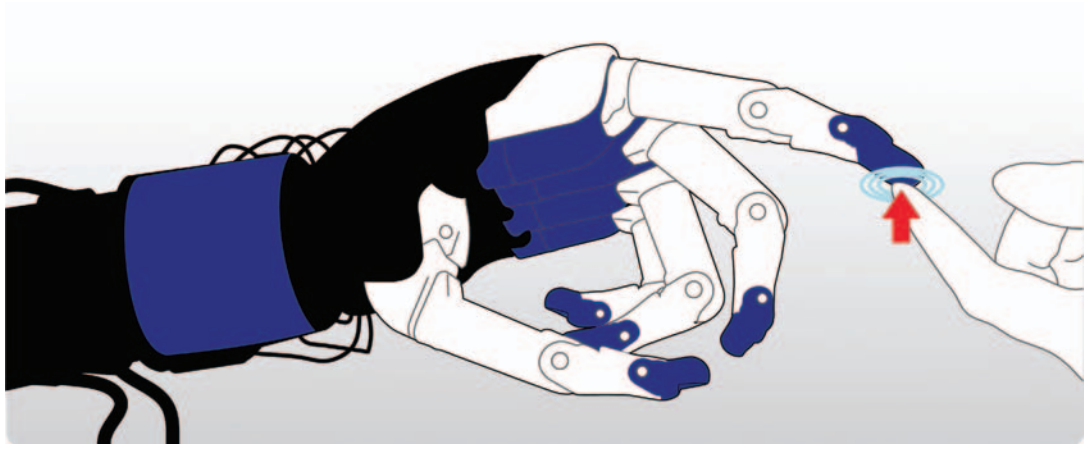
www.bournemouth.ac.uk

EDUCATIONAL CHANNEL GOES LIVE

ABB's brand new online Educational Channel is now live on Eureka's website. The Channel provides news, technical data, information and videos about ABB products to original equipment manufacturers, system integrators and end users.

This month's feature is Safety, to coincide with the new Machinery Directive.

www.eurekamagazine.co.uk/abb



UK company to develop 'electronic skin'

UK company Peratech has been commissioned by the MIT Media Lab to develop a new type of electronic 'skin' that enables robotic devices to detect not only that they have been touched but also where and how hard the touch was.

The key to the sensing technology is Peratech's patented 'QTC' materials. QTCs, or Quantum Tunnelling Composites, are a new material type that provides a measured response to force and/or touch by changing its electrical resistance much as a dimmer light switch controls a light bulb. This enables a simple electronic circuit within the robot to determine touch. Being easily formed into unique shapes - including being 'draped' over an object much as a garment would be, QTC's provide a metaphor for how human skin works to detect touch.

QTCs provide a 'proportional' response - in other words detecting how hard they have been touched. Further, using Peratech's patented xy scanning technology, the robot is able to detect where on a matrix of sensors applied to areas such as the forearms, shoulders and torso it has been touched.

www.peratech.com

DESIGN CONSULTANCY MEETS SCIENCE MINISTER

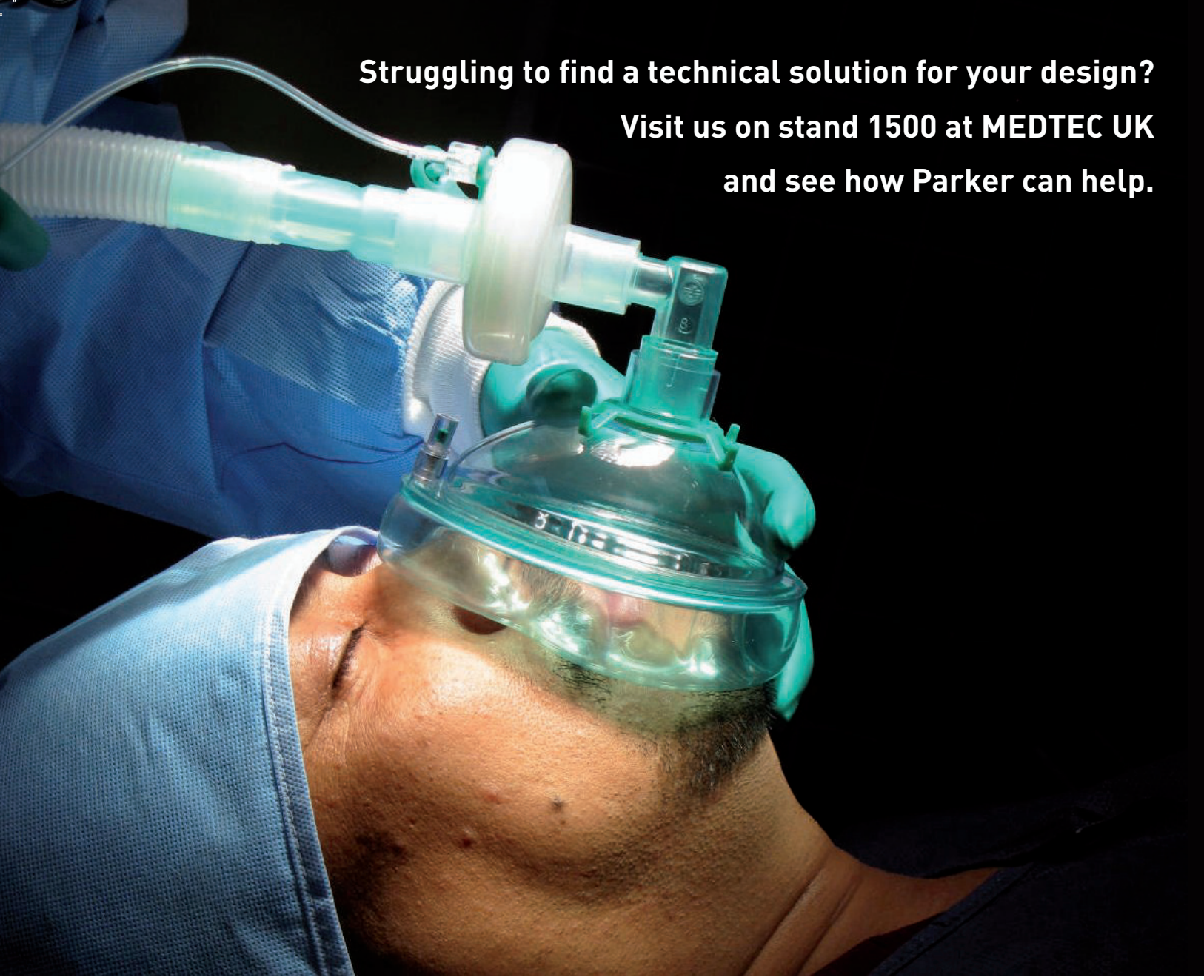
Engineering consultancy Frazer-Nash has briefed Minister of Science and Innovation Lord Drayson on its work in support of the rehabilitation of service personnel.

Consultant Alex Knight was invited to the Centre for Defence Enterprise (CDE) to showcase two innovative pieces of equipment that Frazer-Nash is designing and building for Headley Court Rehabilitation Centre. Headley Court supports casualties of war, many of whom are undergoing an intensive period of amputee and prosthetic therapy.

Frazer-Nash was recently awarded a contract by the CDE (funded by the Defence Technology and Innovation Centre) to develop an instrumented wheelchair wheel and an exercise bike for Headley Court. Known as the Powerwheel, the instrumented wheel will measure the force put into the rim by the user and will be used to help Headley Court staff tailor specific training regimes. The exercise bike being developed will specifically aid victims of blast injuries whose rehabilitation is restricted by the external fixator cages used to set complex bone fractures.

Alex Knight, Frazer-Nash Engineering Consultant, commented: "We are very proud to be supporting the CDE on these important pieces of work."

www.fnc.co.uk



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Linear actuators ensure optimal performance

HepcoMotion has developed a family of actuators to address the demands of X-Y-Z linear motion systems.

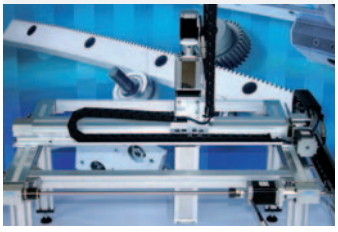
The HepcoMotion light- and medium-duty X-Y-Z systems are ideal for all manner of industrial and scientific applications.

The X-axis foundation of the system is the PDU2 linear actuator, which features the HepcoMotion ultra-high performance Herculane wheel technology in a compact and cost-effective belt-driven unit. The Y-axis requires particularly high load capacity and stiffness against twisting loads. .

The needs of the Z-axis are different again, with enhanced linear force and higher gearing being required. The new PSD80 linear actuator is perfectly suited for this duty, with drive from a super-smooth stainless steel lead-screw operating with a bearing polymer nut. Again it uses the Herculane wheel technology.

All units fit together using standard components to create multi-axis systems which perform better than similar units where general purpose actuators are used for all axes.

www.hepcomotion.com

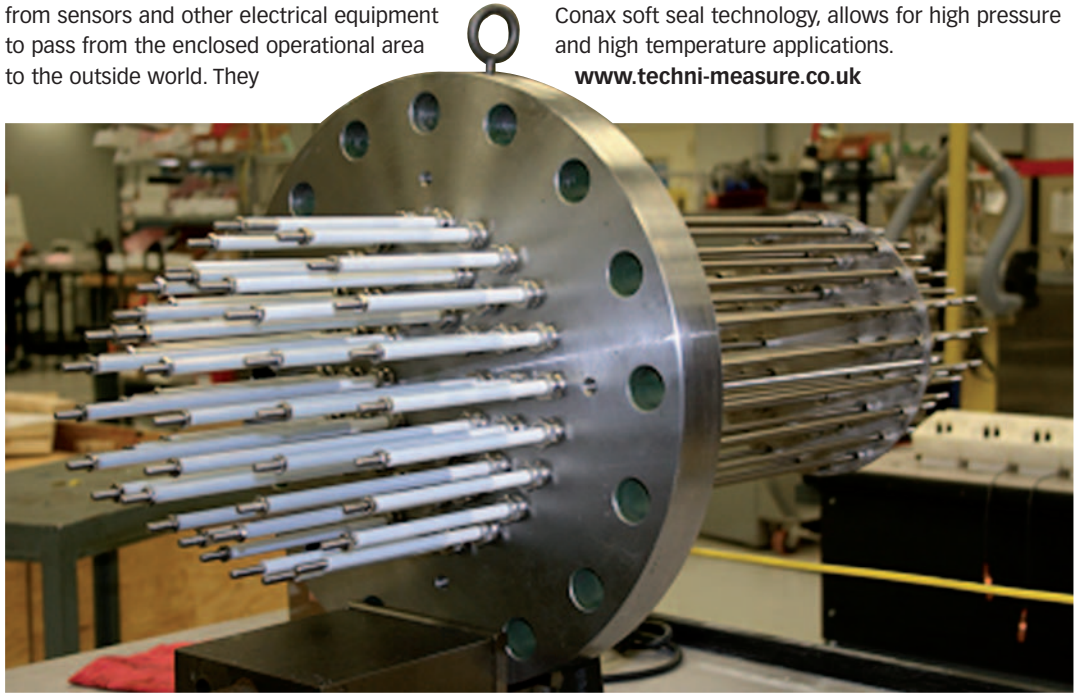


Seal fittings are high performers

Techni Measure has introduced the Conax Technologies range of high quality compression seal fittings and temperature sensor assemblies into its range of products.

Compression seal fittings allow electrical signals from sensors and other electrical equipment to pass from the enclosed operational area to the outside world. They restrain the elements from moving as a result of pressure differentials, prohibit the leakage of gas/liquid media along the elements, and can electrically isolate the elements from the mounting device. Many different seals are available, and the Conax soft seal technology, allows for high pressure and high temperature applications.

www.techni-measure.co.uk



Quick-clamping shaft collars

Ruland Manufacturing and Techdrives have launched quick clamping shaft collars that are ideal for fast adjustments or machine shafts without the need for any tools. Clamping collars can be fixed, adjusted and removed without damage to the shaft, unlike set screw collars which create burrs.

Normally, clamping collars are fixed by tightening one or two bolts. This new design of clamping collar uses a clamp handle, which means it can be fixed in an instant. Machines that need regular adjustment are ideal cases. Examples are packaging, printing, medical, machine vision or semi-conductor manufacturing to retain rolls, guides or fixtures with axial holding power up to 500N.

Quick clamping shaft collars are easily installed, while the collars slide on the shaft smoothly. They have easy finger access to the handle that allows them to be removed or positioned without tools, using only the strength of the finger.

The handle of the collars can be locked, fixing the collar in place. When installed, the handle is flush with the outside diameter, which makes them suitable for rotating and stationary applications alike.

www.techdrives.co.uk

Compact enclosure aids installation

A compact IP 55/IP 66 enclosure with type designation A4 is available from Danfoss. Compared with the existing A5 enclosures, the dimensions have been reduced by 33%. Nevertheless, the power components fulfil the most demanding requirements, even in applications with high overload torque, long motor cables, or ambient temperatures up to 50°C (maximum).

Designed for the Danfoss frequency converter families VLT AutomationDrive, HVAC Drive and Aqua Drive with power ratings up to 4 kW, the A4 enclosure is available in IP 55 (NEMA 12) and IP 66 (NEMA 4X) versions, extending the existing product line. Power components rated at up to 4 kW are available for input voltages of 380 to 480/500 V (three phase) and 2.2 kW 200 to 240 V (three phase).

The flexible power module design allows the use for machinery or conveyors requiring high over-torque. Similarly, the new unit can also address motors with normal over-torque, typically like fan or centrifugal pumps.

www.danfoss.com

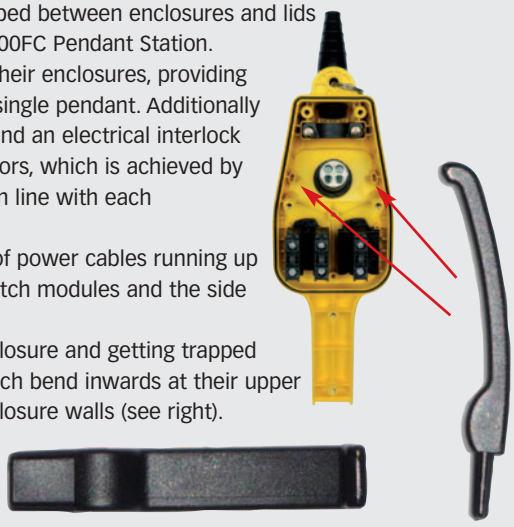
Solution to last month's coffee time challenge

The solution to last month's challenge to find a way of preventing wires inside electrical and electronic modules from becoming trapped between enclosures and lids is to be found inside the Allen Bradley 800FC Pendant Station.

These can have 3, 5, 7 or 9 holes in their enclosures, providing customers with up to 18 functions in a single pendant. Additionally there are mechanical interlock latches and an electrical interlock capability for one and two speed operators, which is achieved by wiring a normally closed contact block in line with each operator/function.

This means there can be quite a lot of power cables running up and down the pendant between the switch modules and the side walls.

To prevent them overflowing the enclosure and getting trapped when the lid is put on, nylon fingers which bend inwards at their upper extremities are fitted just inside the enclosure walls (see right). Threading the wires inside the fingers ensures that there is no way they can become trapped.



More information at www.rockwellautomation.co.uk

A design for end of life

Once, it was acceptable just to design a product to work well and not to worry about what became of it at the end of its life cycle. Today, however, engineering companies have to worry about what happens to their goods once their purchasers have completely finished with them.

Pressures come from government, customers, the public and that most fundamental need: to maximise profit. Equally, there is the question of which method of end-of-life recovery represents best practice from both a financial and an environmental point of few. Needless to say, this has placed an additional burden on engineering designers.

Regulations relating to end of life (EoL) recovery that have to be conformed to in Europe include: REACH (Registration, Evaluation and Authorisation of Chemicals), RoHS (Restriction on the use of Hazardous Substances) in electrical and electronic equipment, ELV (End of Life Vehicles), WEEE (Waste Electrical and Electronic Equipment) and EuP (Energy using Products). As if this weren't enough, for those who trade internationally, there is also GADSL (Global Automotive Declarable Substance List), a list of special requirements imposed by the State of California, JIG (Joint Industry Guide), and additional requirements imposed by individual countries.

Obscuring the issue

Unsurprisingly, these myriad regulations have tended to obscure rather than illuminate the issue. For instance, when asked by Eureka if he found the various European Union regulations to be subject to different interpretations in different European member states, one automotive engineer said: "Two engineers sitting next to each other often don't manage to agree on what the regulations mean."

Software is already helping with one of the most basic problems; namely the materials that are used in the products themselves. 'Insight' is the latest form of a product originally called EMARS (Environmental Material Aggregation and Reporting System) which comes from Synapsis Technology. John Fox, director, product and market strategy, told a recent PTC seminar that it originated from work with Motorola, but is now being aimed at the automotive and aerospace sectors.

InSight includes patented technology to undertake Bill of Material (BOM) aggregation as well as a system for asking suppliers exactly what is in the parts they are supplying and logging whether their answers conform to regulations or whether they have given either partial or no replies. Graphical icons show up problems with components, possible problems if regulations change and applications where some parts can be used, but not others.

When asked if Insight could be tailored for SMEs, however, Fox responded: "Our customer base generally consists of manufacturers who have complex products and supply chains. For these, it's very difficult and costly to track restricted substances, suppliers and analyse products to ensure compliance. Smaller companies tend to have simpler products and few suppliers so have less of a need for automation." That said, small companies can make use of mainstream commercial CAD software by linking design data to information about regulatory requirements in PDM and PLM systems.

Assuming products are properly composed in the first place, however, the question arises of what can be done at the other end of the process to make the best use of them. Should they be crushed or shredded for recovery of materials? Or designed so that parts can be carefully recovered so that they can be remanufactured and sold again? Or should they be made repairable and upgradable and put back into service?

Getting maximum value

The traditional end of life treatments, of course, have tended to involve the crushing and/or shredding of products for recycling. However, this can result in low-value recyclate streams and does not extract the maximum value from EoL products. This means that the designing of goods for re-use or remanufacturing an increasingly attractive proposition for reasons that are both environmentally and financially sound.

Of course, the automotive manufacturing industries and their Tier 1 suppliers have long been in the habit of reconditioning their components for re-use. Long before they were required to re-use or recycle, they found it made good sense to take back worn units, refurbish them and then sell them back to customers. Aircraft engines have always been designed to be stripped, overhauled and rebuilt, as have most major items of defence and railway equipment. Equally, Xerox has long used remanufacture as a means of creating ongoing revenue streams.

Nonetheless, specifically designing products for remanufacture is a relatively new concept as far as most manufacturers are concerned. A remanufacturing system collects EoL products, returns them to their original condition then retails them at an as-new price. Importantly, remanufacture results in the extension of a product's life and promotes the re-use of components and materials. It is a means of generating (even potentially doubling) profits, preventing waste and conserving natural resources.

Remanufacturing is currently worth approximately £2.5billion in the UK, but design for remanufacture itself remains little practised. This, according to Caspar Gray, co-director of design consultancy Wax RDC is due to a 'widespread lack of OEM engagement in the process and designers' lack of awareness of eco-design, let alone design for remanufacture'.

Ever-increasing regulation and new thinking about end of life are putting pressures on design. Tom Shelley reports on the different approaches to these problems

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Wax RDC specialises in design for remanufacture and recycling. Indeed, it encourages its OEM partners to take advantage of the business model of remanufacture and incorporates redesign for remanufacture into its design process. Examples of Wax's work include Meo, a handset designed for Mioteq which incorporates a new business model with a two-tier lease system.

Discussing the processes required for successful design for remanufacture, Wax's co-founder and director Damien Jones explains: "There are three things you have to do: make sure you can get the product back; make sure you can take it apart cost effectively; and make sure there is a market for the product once it has been remanufactured. All of these can be influenced by design, using life cycle thinking. Research and benchmarking of current, competitive products is essential."

DAVID PARKER: "IN REALITY, INNOVATION TENDS TO INVOLVE A LOT OF FALSE STARTS AND CONFUSION, AND IDEAS NEED TO BE 'MORPHED' UNTIL THEY WORK

Critically, whether a product is to be remanufactured, reconditioned, or recycled in a way that does not involve shredding, it has to be taken apart. One idea to assist this that once looked very promising, but seems for the moment to have gone out of fashion is 'Active Disassembly', which was originally invented by Dr Joseph Chiodo of Brunel University. The idea behind active disassembly is to use fasteners that either change their shape or decompose when they are heated. Thus, that when the product is heated for one minute in hot liquid at 117ºC or 14s at 165ºC, it falls apart. Shape change can be achieved by using shape memory alloys or shape memory polymers.

However, David Parker, head of remanufacturing at the Centre for Remanufacturing and Reuse, says of active disassembly: "There's been a lot of talk, but not a huge amount done." Much of the research was undertaken with regard to Nokia mobile phones. But Parker says current legislation provides neither stick nor carrot. "Why would Nokia want to do it? If it's somebody else who does the remanufacturing or recycling, what's in it for Nokia? For Nokia, it is added cost and the company is very cost driven. The problem is open supply chains: if the products go back to the original supplier, then it is worth designing them for disassembly. Otherwise, it isn't." When it is, Parker says products need to be designed to be deconstructed with minimum damage.

Going further on this subject, Wax RDC's Jones says: "Design for disassembly is a complex process, but the basic guidelines are: reduce the number of parts in the product; reduce the total number of fasteners used; reduce the number of different fasteners used; reduce the number of different materials used (especially plastics); reduce the number of assembly axes; eliminate adhesives; and use active disassembly components where appropriate."

To this end, it is worth noting that there have been a number of recent developments in fastening that may assist active disassembly. One is a novel patented fastener that locks up firmly to resist vibration without requiring the dab of threadlocker that makes them subsequently hard or, in some cases, impossible to undo. Developed in the US, 'asymmetric fasteners' have a thread with a shallow incline on one side and a steep incline on the other. The wedging action between the shallow thread incline on the nut and bolt or sleeve allows free rotation until resistance is encountered. An additional turn then wedges the parts into a locked and vibration-resistant condition.

Unfortunately, of course, there will always be products that cannot be remanufactured or re-used. This may either be because it is not cost effective to do this, or possibly because rapid technical progress means that nobody wants last year's model. Since companies are increasingly being required to offer to take their products back, however, there is still considerable benefit to be derived from designing such items to be recycled as parts.

In this event, Jones' guidelines become: "Reduce the number of different materials used (especially plastics); if more than one plastic is used, make sure they have different densities; label all plastics with their type in standard form; use finishes compatible with the materials; build in value for the recycler so that it is worth recycling; eliminate adhesives and avoid snap fits, unless made of smart materials; and label the product with recycling symbols."

Increasingly stringent legislation placing responsibility for products squarely at the door of their producers is undoubtedly making the consideration of EOL treatment a priority for designers, manufacturers, recyclers and governments. However, it seems possible that, with the right approach, it could prove to be as much benefit as burden.

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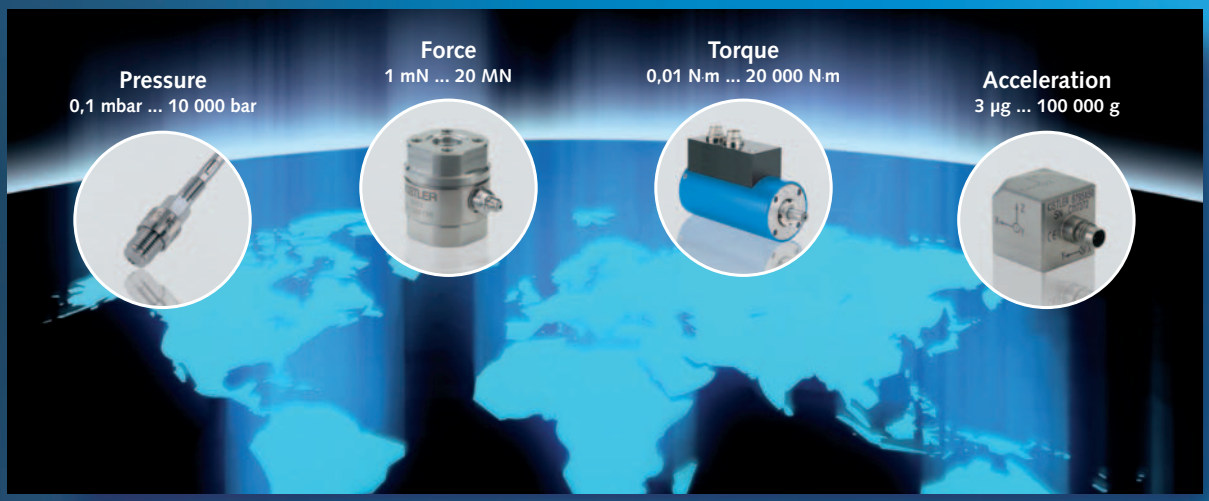

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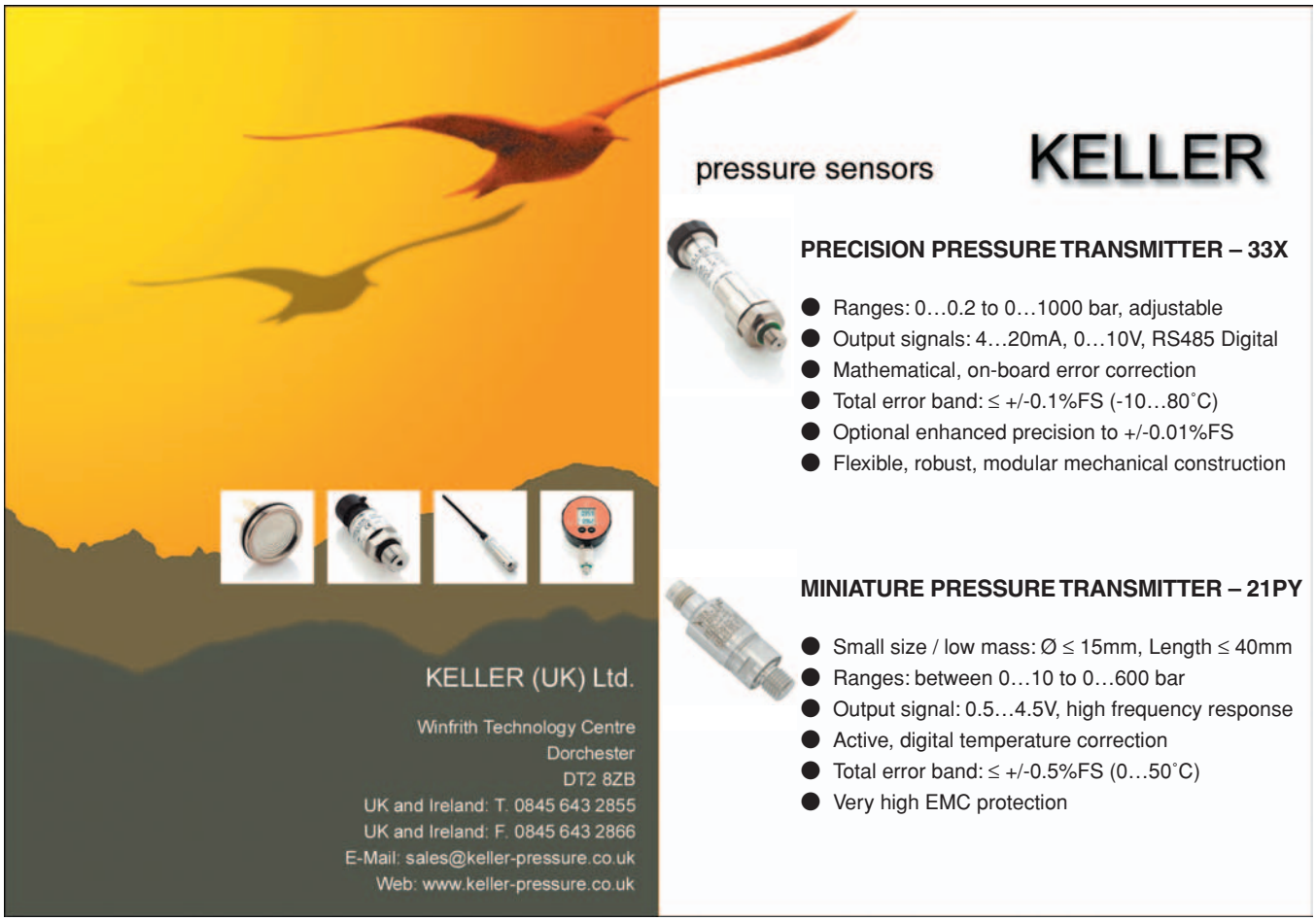


Low-cost surfaces make sprays cleaner

Tom Shelley reports on the development of technologies that have consequences for an exceptionally wide range of industries

The properties of water-repellent or hydrophobic surfaces have long been of interest to manufacturers in a variety of fields. Now, however, a new process means they have the ability to produce engineered sprays when a jet of liquid is aimed at them at relatively low pressures.

The increasing pressure on the use of volatile organic compounds (VOCs) makes this development of significant potential interest to those who make products in sprays cans. They are also of interest to manufacturers of medical products who want people to inhale and retain droplets; makers of agricultural sprayers, who want users not to retain chemical droplets in their lungs; and even manufacturers of automotive fuel injection systems.

42 Technology in St. Ives, Cambridgeshire, has been working with a new superhydrophobic (water-repelling) surface developed in the research group run by Professor Ullrich Steiner in the University of Cambridge's Cavendish Laboratory. The method, however, works with any superhydrophobic surface, including those already in commercial production.

Superhydrophobic surfaces are all are based on what is termed the Lotus effect, where the naturally water-repellent nature of the leaf surface is augmented by hydrophobic hairs, whose tips enhance the effect and ensure that less than 1% of droplet surfaces are in contact, meaning that they roll off with entrained dirt.

Superhydrophobic materials currently available commercially include the 'Hirec' paint developed by NTT Advanced Technology for its microwave dishes and the plasma-deposited coatings developed by P2i (see box), which also work with oil (oleophobic).

The key advantage of the latest Cavendish-developed coating, however, is that it is potentially much cheaper than some of the others. The surface of interest is first coated with primer and polytetrafluorethylene (PTFE). It is then sprayed with a liquid that lays down a mixture of PTFE and polystyrene (PS) spheres. Firing this boils off the PS, leaving a skeleton of protruding structures made of PTFE.

A jet of water-based solution directed onto such a surface creates an unstable disc that immediately breaks up into droplets. This was demonstrated with nothing more sophisticated than a piece of Professor Steiner's material and a small syringe to create the jet.

"The challenge for many potential applications, including possible self-cleaning car windscreens," according to 42 Technology managing director Howard Biddle, "is to make superhydrophobic materials sufficiently robust and durable." However, this is not a problem with aerosol spray cans, since the tiny piece of material on which the jet impacts is relatively protected from the outside environment, and the cans are one use only.

Most research until now has been undertaken in order to improve inkjet printing, agricultural spray adherence to leaves and painting and has been aimed at reducing the use of aerosol sprays. "The key," according to 42 Technology consultant Chris Walters, "is the creation of instability."

The dimensionless number that turns out to govern this (known as the Weber number) is

calculated from: density x characteristic velocity^2 x characteristic length/surface tension. For a good aerosol spray, the Weber number should be 200 or more.

For a small device, this means that a pressure of 3 bar will theoretically produce an aerosol spray with droplets about 5µm across, whereas at a pressure of 0.7bar, they will be around 20µm. For a medical inhaler, the ideal particle size is 5 to 10µm, whereas for applications where inhalation is undesirable, such as a hairspray, droplet size should be 15 to 30µm.

A conventional spray can uses HFC (hydrofluorocarbon) propellant of less than 3 bar pressure, which boils at the nozzle and can comprise 60% of the spray can contents. Despite the insistence of the makers of HFCs that they are totally non-toxic and friendly to the environment, suggestions that they have major global warming potential has led to a move to using nitrogen or air in the head space, compressed to 10bar. The only problem, apart from the need to contain a higher pressure, is that as the gas is used, the pressure falls off and the spray size becomes coarser. Other ideas include using compressed CO_2 as a propellant, while butane, already used in many aerosols, poses a significant fire and explosion hazard. Using the new technology, on the other hand, requires nothing more high-tech than a small spring and piston or a hand action squeeze pump and leaves no residue in the sprayed aerosol, a particular benefit to users of perfumes and cosmetics.

Biddle suggests that banning other propellants 'awaits suitable technology', which he believes his company now has. Other potential applications include agricultural sprays and paint. And, although Professor Steiner's material is hydrophobic and not oleophobic, 42 Technology director Dave Wilson suggests it is also possible to make superoleophobic surfaces by an etching process that produces a pattern of micro 'mushrooms'.

www.42technology.com
www.hirecpaint.com

Design Pointers

- Impinging a jet of water-based liquid onto a superhydrophobic surface generates an unstable disc that breaks up into aerosol droplets
- This technology has implications for numerous applications, but particularly in the replacement of aerosol sprays.
- The pressures required to produce sprays by this method are considerably lower than those required to produce them by more conventional routes
- The superhydrophobic surface used is a new one, that is potentially very low cost, but there are plenty of other superhydrophobic surfaces that are already commercially available, including nano coatings that chemically adhere to a wide range of surfaces

Water-repellent nano coatings that don't rub off

A plasma process for laying down both superhydrophobic (water hating) and oleophobic coatings on a variety of substrates, including shoes and textiles has been developed.

The technology was invented by Dr Stephen Coulson while undertaking his Ph.D. research at Durham University. He was consequently employed by the Ministry of Defence to set up a facility to protect military clothing from chemical nerve agents. Dr Coulson is now the chief technology officer of P2i, headquartered in Abingdon, Oxfordshire, which was founded in 2004 as the first technology transfer from the MoD's Defence Science and Technology Laboratory (DSTL).

The MoD has retained ownership of the three core patents, but P2i has a sole, royalty-free worldwide licence for the technology, and has subsequently secured an additional 30 patents to cover every aspect of applying the technology as an industrial process.

The pulsed plasma process activates the surface to be coated and polymerises a tiny amount of a complex protective monomer in situ, creating a polymer that is chemically bound to the surface, but is only a few tens of nanometres thick. A slide presented by Dr Evans, P2I's applied research manager, at the Nanotechnology KTN conference, showed that it appears to create a lotus effect coating, but with protuberances that are on a molecular scale. He said that it has a contact angle with water of 120º and a contact angle with hexadecane of 81º. Various monomers are mentioned in the patents, including substances such as long-chain fluorinated acrylates. The plasma process used is carefully designed not to break up the structures of such molecules.

When asked how durable it was, Dr. Evans replied that, because it was chemically bound to the surface, it was as durable as the material it protects. Apart from clothes and shoes under the 'Ion-mask' brand name, the technology is now also applied to receiver 'in canal' and 'behind the ear' hearing aids, in order to protect them from the effects of water and sweat, under the 'Aridion' brand name.

There are also proven industrial applications in engineered textiles, optics, filtration, and bio-consumable products. Tests show that the technology gives performance benefits for materials that include: polymers, metals, fabrics, leather, ceramics, glass and paper.

www.p2ilabs.com

Body of work

Product Partners works closely with clients to achieve the desired results. Quite how closely can be seen from one example where, to produce a piece of medical equipment, it was necessary to get extremely hands on. Says Paul Neal (pictured, second left): "We've spent time at the University of Cambridge with cadavers getting an understanding of the difficulties of ramming something down a cadaver's throat. It was a question of understanding how the product was going to be used and where it was used and what the problems are. And it's that information that you can then take into the initial brainstorming, sketching and development process."

The outsiders

How does a design consultancy contribute to the development of other people's products? Paul Fanning asks Paul Neal of Product Partners.

The role of the industrial design consultancy can be a contentious one as far as many companies are concerned. For some, such organisations may be perceived of as an unnecessary adjunct to the product development process.

Unsurprisingly, Paul Neal, co-founder of leading industrial design company Product Partners (pictured left, second left) disagrees. "I think our diverse experiences benefit clients, who may be bogged down with only having the one experience of 'what they have done before'," he says. "What we can do is bring a fresh and innovative approach to their new (and old) problems as we're not restricted by past experiences and failures. Sometimes you need an outsider's input."

Nonetheless, Product Partners does face resistance from time to time. However, as Neal points out, this can often be a function of when and how its clients come to it. "They come to us at all sorts of stages," he says. "It could be that they've got into a mess and come to us as a last resort, which is not really where you want to be, as sometimes you get a reluctance on the part of certain individuals to work with you. On the other hand, there are other companies who involve us from the strategy stage all the way through to production."

Since being established by Neal and co-founder Steve Gallichan (pictured left, far right) in 1995, Product Partners has risen to become an internationally-recognised and award-winning consultancy. Indeed, not only has it won the Plastics Industry Awards, it is the only consultancy also to sit on the judging panel.

With clients ranging from industrial names like Baldor and Parker Hannifin to leading manufacturers of consumer and medical equipment, the company's client range is described by Neal as being 'more or less everything except aviation, space travel and automotive', pointing out that 'designers thrive on diversity and not speciality'.

So how exactly does Product Partners fit into the development process? Says Neal: "We effectively become an extension of the development team; undertaking responsibility for the areas around the inner periphery of the development process. Often we are a catalyst for the project once it's underway in one form or another. We can affect marketing, we can question engineering, but very often, we bring everything together. We get involved with looking at the market from a product design point of view – what the market might require; we develop the concept and stylise it; we engineer it in CAD; and we have a hands-on model shop and some basic FEA and rapid prototyping. Ultimately, though, we bring the same process to a problem regardless of whether the problem is a sutureless connector for heart valves or for something in the drives and controls market."

However, there is no sense in which the company would claim to be expert in every area, with the result that sometimes it needs to consult others. Says Neal: "We have associations with various companies that we can dip into to expand our team. Those expertise can come along with the client, but if necessary, we can manage the whole thing."

The rise of the inventor in recent years (something Neal ascribes to the popularity of 'Dragons' Den') has been an interesting development for the company, with a number of successful projects having resulted from such approaches. However, it can be a little hit and miss at times, as Neal explains: "First of all, you have to make sure that these guys have actually researched the product they've got. Someone can come in with a great idea and you go on Google and there it is already. That said, there are one or two we've worked with who come up with really great ideas and some of them have gone on to be quite lucrative."

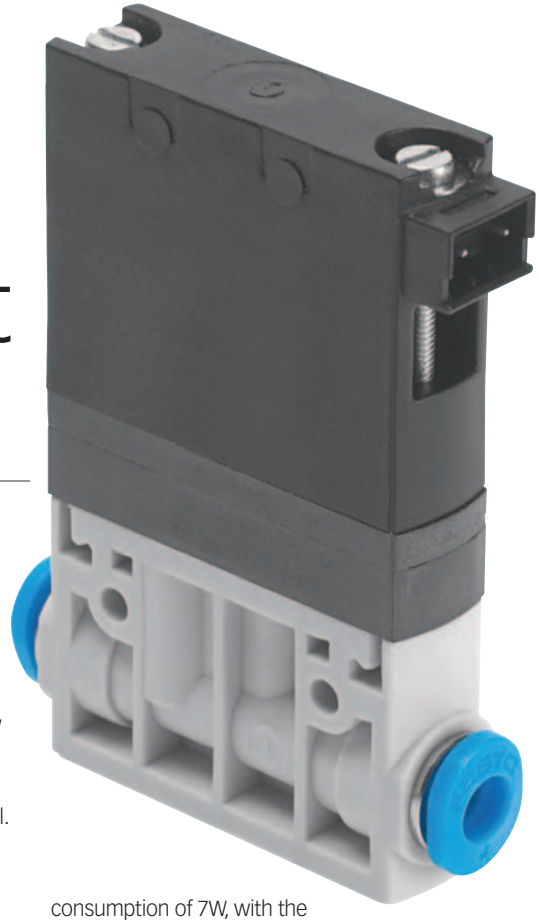
We effectively become an extension of the development team; undertaking responsibility for the areas around the inner periphery of the development process

For all their successes, however, there can still be a perception of Product Partners as not being 'proper engineers'. Says Neal: "We're creative first and engineers second, which often means we don't really fit in anywhere. It's always been that way, though. By the other people at art school, industrial designers like us were always regarded as engineers. But when you leave art school and start working in engineering, to an engineer you're a designer. Only recently we were described by one client as 'the felt-tip fairies' – that was quite a shocker!"

www.productpartners.co.uk

Faster solenoid valve gives food for thought

A longer-life, quick-response solenoid valve designed for sorting applications could have implications for the technology as a whole.



High speed optical sorting machines rely upon rapid response pneumatic ejector valves, or 'jet valves', to intercept and remove foreign or defective items from a stream of material moving along a conveyor or falling under gravity from a chute. Materials may vary from grains of rice and wheat through to peas, coffee beans, nuts or increasingly, waste materials for recycling.

Such machines rely on optical/vision systems to identify reject items. An eject valve, usually forming part of an array of such valves, is switched on to create an air pulse for a period of time just as the part passes the appropriate eject nozzle. To ensure accurate rejection of only the selected items, the pulse timing needs to be very fast, repeatable and reliable.

Nearly all jet valves employ a direct-operating solenoid, to provide the fastest possible response. For many years, these types of valve had a typical response time – the time period between the application of a trigger signal and the pressure reaching a defined level downstream of the valve – of about 20ms. Manufacturers have recently managed to get this figure down to about 10ms, but it is still the case that standard solenoid valves cannot provide the performance required for high-throughput applications.

The Mean Time Between Failure (MTBF) figures for standard jet valves are one area of concern. Most valves on the market today that are designed for sorting-type applications have an operational life of about 1 billion cycles. This sounds quite high until you consider that a modern, high-throughput application will have a large number of solenoid valves installed side by side on banks of manifolds. After a while, successive valve failures can lead to the machine being out of service for untenable amounts of time. Valves with a much higher operational life rating would make it cost-effective for users to consider replacing entire manifolds as part of their planned maintenance schedule, reducing machine downtime significantly.

Steve Sands, Festo's automation specialist, outlines the problem: "Traditional solenoid valves normally have a round armature inside the coil and you get friction in two places: within the solenoid itself you get metal rubbing on metal and, if you use a rubber compound soft seal in the poppet at the bottom of the valve, after a few million cycles you start to get hardening off and you start to lose the repeatability of the timing."

Another problem is heat, or rather, its removal. A typical solenoid valve can have a power consumption of 10W during its 'on' time, which despite the fact that it is probably only operating with a duty cycle of 50% or less, means that a significant amount of power is dissipated in the solenoid. The problem is exacerbated by the fact that many users elect to over-drive the solenoids to secure a faster response time.

In contrast, the MHJ series of jet valves from Festo has a typical switching time of just 0.7ms and also offers high short-term and long-term repeatability of 0.1ms. A typical service life of 5 billion operations is claimed, although 10 billion has been achieved.

Based on a novel, short-stroke solenoid and a patented damping plate, the design has only one moving part and dispenses with dynamic seals and lubrication. The valves have a power consumption of 7W, with the option of adding holding current control to reduce this to 2W after the initial turn-on period, and can be triggered by standard 5V PLC-level signals.

Given the number of solenoid valves employed, their cost is a critical factor. Says Sands: "Because they use so many of these in their machines, this isn't a product where you can afford to be pushing up their costs. They have to be designed in the same order of costs as standard valves."

The system was developed using extensive CAE modeling of the magnetic, temperature and flow characteristics. "You can only really achieve this through computer modelling," says Sands. "If you leave this to life testing, it just takes too long and you'd never get through the cycle. Your time to market would be absolutely horrendous. I think it's one of our most extensively modelled products."

While the product was developed with a very specific end market in mind, its success in operation has opened up other possibilities. Says Sands: "The spin-off, of course, is that whereas with other solenoid valves we talk about a life of something in the region of 20m operating cycles, a product that has now gone beyond 5bn operating cycles obviously that starts to give us the data feedback that we can start to consider and use in other product developments."

www.festo.com

Design Pointers

- New solenoid valve technology with high long-term repeatability and a long life cycle has been developed for use in high-speed sorting applications
- The technology has the potential to be developed into other areas
- Based on a novel, short-stroke solenoid and a patented damping plate, the design has only one moving part and completely dispenses with dynamic seals and lubrication.

Renewable targets drive innovation

Government targets and investment have given a major boost to the renewables market. Paul Fanning looks at some of the ways in which companies in the drives and controls sector are meeting this need.

The market for renewable energy generation has transformed from a niche application to a major industry. The EU-imposed target of producing 15% of the country's energy from renewable sources by 2020, the recent announcement of the power companies with responsibility for achieving this and the availability of government-funded incentives for companies working in this sector have only served to concentrate minds.

Nowhere has this been more the case than in the drives and controls market, where a number of companies have long been involved in the construction and implementation of technology in a variety of projects and are only too keen to exploit the opportunities provided by this impetus.

The major concern is reliability, as ABB's principal UK sales engineer for drives Julian Hobbins points out. "In renewables, it's all about reliability," he says. "These things have got to be rugged and reliable because, when they're working, everything's fine and dandy, but as soon as one of them stops working, it's headline news and can destroy all that good work overnight."

Clearly this need poses considerable challenges when it comes to choosing the drive and control technologies. The difficulty arises in the choice of a system appropriate to the application. One instance of this can be seen from its involvement with wind power generation expert quietrevolution to develop the QR5, a vertical axis wind turbine designed to operate in urban areas. The wind turbine turns an ABB permanent magnet motor, which is linked to an ABB industrial drive acting in regenerative mode to provide the energy conversion and regenerate power back into the grid. The motors themselves are designed exclusively for frequency converter supply. ABB industrial drives are available with permanent magnet motor software to integrate with these motors.

ABB and Parker Hannifin are developing new drive and control options for wave and wind power

The ABB industrial drive offers a number of benefits to the QR5, including the ability to motor to correct speeds to enhance wind turbine efficiencies very quickly. The ABB industrial drives used in the application feature direct torque control (DTC) technology, which allows variable rotor speed to optimise performance at any given wind speed.

Says Hobbins: "For quietrevolution, the speed of the direct torque control that we operate enabled it to do things like gust tracking, which the company hadn't even considered. That gave more efficiency from the vertical axis wind turbine. Other examples are where people have gone for a DFIG [Doubly Fed Induction Generator] type configuration, where the inverters are not fully rated. In the event of problems, we operate a crowbar; an intelligent switch that enables them to burn the excess energy for the short term while the grid's not available and then go straight back into generating mode without all the wind turbines toppling over like dominoes."

The use of permanent magnet motors of the type employed by quietrevolution is an increasing trend in the renewable sector, but one which brings with it its own set of problems, according to Hobbins. "We've analysed the market and there's a move towards permanent

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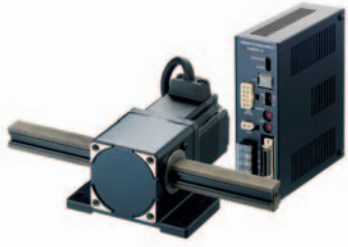

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magnet. There are lots of weird and wonderful designs coming along, but, as with anything, there are advantages and disadvantages. The advantages are that across the speed and torque range it's more efficient, but its disadvantages are limited top speed and limited overload capability… we can't dictate to the market, but when we do the analysis dispassionately, then a medium speed gearbox plus a permanent magnet motor look the best all-round option."

Parker Hannifin has also got an established reputation in the renewable market and has recently established a Renewable Energy Team led by Kevin Rowe to meet demand. He believes that the increased demand for more powerful wind turbines is already forcing more sophisticated drive and control options to be employed. "When you look at the original wind turbines," he says, "they were pretty basic hydraulics – a low-cost item, effectively. But as the wind turbines move forward in terms of power output, you've got to look at more sophisticated electronic/hydraulic controls."

Like many, Rowe sees the future lying in direct drive technology. He says: "One of the biggest problem a turbine has is the gearbox. If we can eliminate that in favour of electric drives that will be the way forward. The obstacle, of course, is the cost. You're looking at a couple of thousand pounds in difference at the moment. However, in terms of reliability, when you think about an offshore wind turbine and the costs and possilbe risks involved in sending a man out to maintain or repair a gearbox there, those costs may seem worthwhile."

Moves towards direct drive technology are already afoot. The most notable example has come from Siemens Energy, which recently installed the first prototype of a direct-drive wind turbine.

Aimed at the high-end, onshore market, the new SWT-3.0-101 DD is a gearless machine with a power rating of 3MW. Siemens will thoroughly test and validate the performance of the SWT-3.0-101 before the new product will be officially launched for sale in 2010.

Clearly, one of the advantages of the direct drive technology is the reduction of the number of moving parts, with consequent advantages in terms of maintenance time. In the Siemens prototype, for instance, the number of parts was reduced by half when compared with geared machines. Nonetheless, the company has been careful to point out that it will continue to produce wind turbines based on the standard gearbox design as these have "proven to be exceptionally robust and reliable".

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DESIGN BETTER PRODUCTS

Cloud computing offers silver linings

Tom Shelley reports on how product development is being speeded up by cloud-based computing and other advances

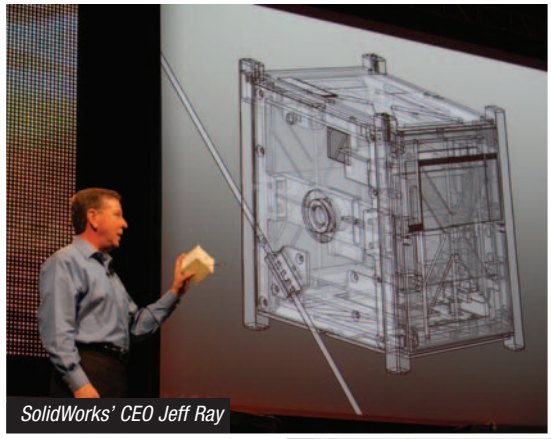
Cloud computing was definitely the hottest subject at this year's SolidWorks World event in Anaheim, California.

This was hardly to be wondered at, as cloud computing allows users perform the bulk of their computations on a group of servers, drawing on computing power in the same way that electricity is drawn from the mains as required. This greatly accelerates the opening of large assemblies, finite element analysis, photorealistic rendering and other intensive tasks. In addition, if there is a system hang up or crash, no data or time is lost and a user can immediately restart where they left off.

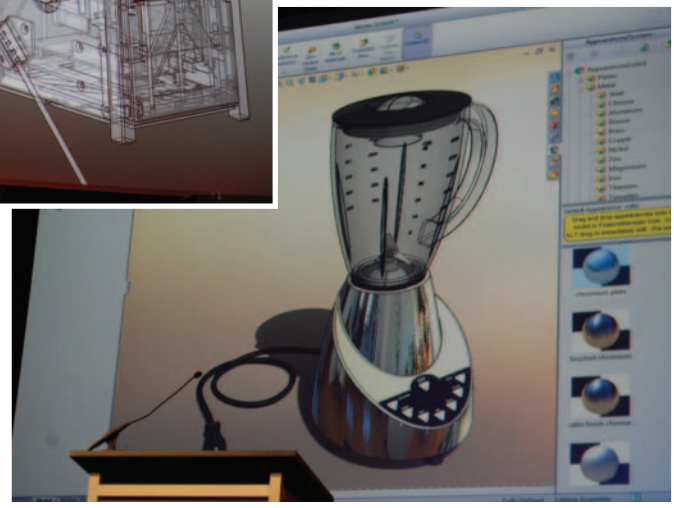
Furthermore, SolidWorks product marketing manager Mark Schneider was able to demonstrate that, by using clouds via the Internet, the software would happily run on a Mac or a Toshiba Netbook or anything else. "Internet is all you need", he said.

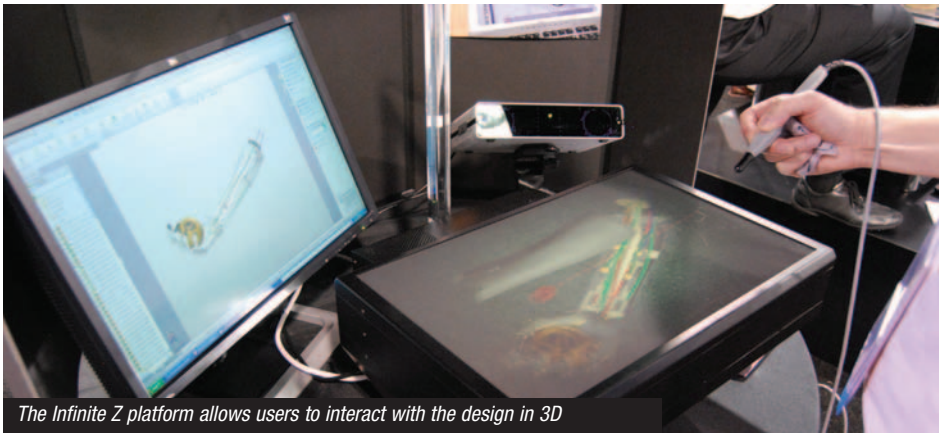
With shipping of cloud-based applications scheduled to start later this year, we asked about the logistics of making is happen on a large scale and costs. Jon Hirschtick, the founder of the company, said: "Our vision is that we will retain a cloud resource and make it available to users."

Presently, the company is using computers provided by Amazon, which Hirschtick said "has achieved a huge lead in cloud computing. Costs are currently about 50 cents per CPU hour, but Solidworks would not yet be drawn on how much they planned to charge customers for this. However, Bernard Charlès, CEO of SolidWorks' parent company Dassault, did reveal that the software would not be purchased, but operated on a subscription basis. He also said that the company will have its own clouds as well as using those from third parties. The choice, he said, will be highly influenced by differing national policies, such as those relating to defence work in the US.



SolidWorks' CEO Jeff Ray





The Infinite Z platform allows users to interact with the design in 3D

On the subject of security, Hirschtick said: "Your money is safer in a bank than under your bed" and argued that data was similarly safer across a cloud of well-managed computers than in an individual PC. He also maintained that data was less likely to get lost in a cloud, saying: "We are not going to get rid of crashes, but clouds will help recovery because the database is not updated just once in a while but continually – like an online business application." In the event of a crash, operators can simply walk over to another computer and restart.

Perhaps unsurprisingly, the plans to make the software work on any platform stem from user input. Says chief technology officer Austin O'Malley: "[Users] want to collaborate virtually and access their data anywhere, even if they

only do actual design work in the office with access to a big screen." He also said the company is continuing to investigate alternative ways of interfacing to computers, "There are going to be lots of ways, there is going to be a plethora of devices – we are looking at a lot under non-disclosure agreements."

One such device on show was the Infinite Z platform, which came out of a joint research project with SolidWorks. The three demonstration units each comprised a horizontal LCD screen, producing a 3D image observed through polarising glasses, and a device mounted above it to detect the position and orientation of a special 'Stylus' through which the user interacts with the software. Applications on show included: a 3D sketcher, which allowed pipes to be routed in a plant in 3D; a 'Snorkel camera', which allowed the user to see fly through images selected by moving a virtual camera in 3D; and a 3D assembly that included tubes that could be lifted out and looked through.

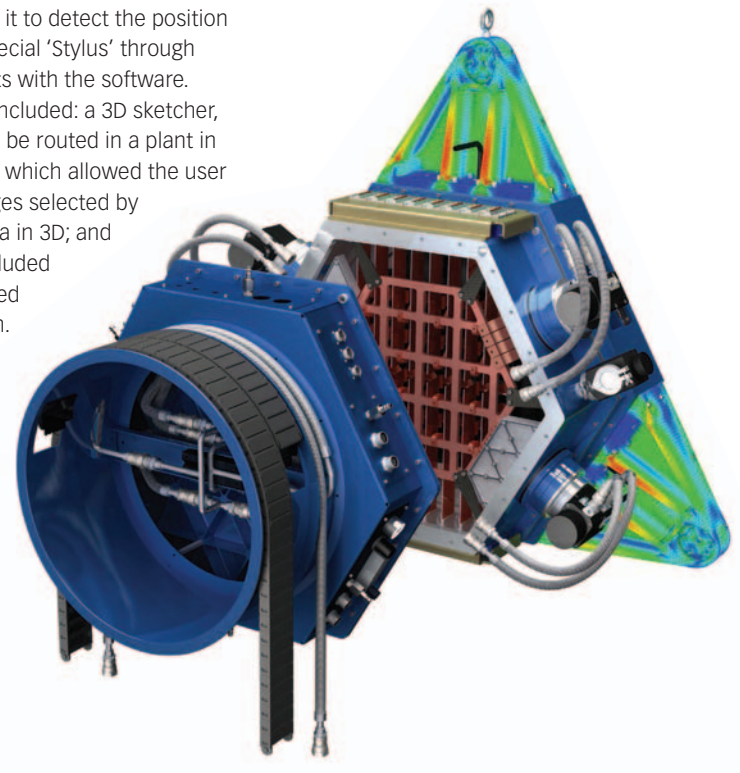
"Users want to collaborate virtually and access their data anywhere"

One of the highlights of the event was the sneak preview of what users can expect to see in SolidWorks 2011, whether hosted in a cloud or on a user's own PCs. This began with the announcement by Solidworks' CEO Jeff Ray that: "More than 50% of the R&D effort has been focused on improving reliability and stability." Speed is improved by releasing memory as soon as an operation is finished, releasing 460MB in one example. In addition, Luxology's PhotoView 360 is to be integrated.

Simulation in the 2011 version of SolidWorks will include 2D simplification, so that analyses can be undertaken with finer mesh without incurring time penalties and then projected back into a 3D volume. Dimensions can be applied to a whole drawing all at once and then staggered, spaced out and tidied. A design checker will ensure that issued drawings conform to company specifications. Chamfers and fillets can be done at assembly level and there are new facilities to model intermittent weld beads and to produce weld table documentation.

Walkthroughs in the 2011 version of SolidWorks can use manikins for improved control and realism. There are enhancements to piping and also a feature lock, so that completed features are not rebuilt when a model is rebuilt. In the example shown, this reduced model rebuild time from 65s to 0.4s.

Summing up, Jeff Ray observed: "We will be launching more technology in the next two years than we have in the last 15."



Design Pointers

- CAD on a cloud computing platform allows it to run, open large assemblies and perform compute intensive tasks, such as finite element analysis and photo realistic rendering, more quickly
- Security is considered to be better than on individual PCs. System crashes can be recovered from instantly and models can be viewed and manipulated on most web enabled platforms, including Macs and netbooks
- The first SolidWorks cloud computing product to be made available to customers facilitates collaboration, to be closely followed by an interface to the Enovia V6 PLM package, which should be of particular benefit to those with regulation conformance tasks
- A variety of new interfaces are being studied, including a stereoscopic 3D system that allows working in virtual reality in a way that is not immersive

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Titanium advances into new markets

Tom Shelley reports on why more designers should take a serious look at using titanium alloys

Titanium alloys – as strong as the strongest steels yet half the weight – should no longer be considered as exotics of interest only to aerospace.

Prices are tending to come down, and may drop quite sharply in the next few years, while technical developments continue that enable them to perform better and be manufactured into products in novel ways.

Part of the reason for downward pressure on price is that Chinese companies have gone into production in a big way, mostly based in Baoji, China's 'Titanium Valley', but we should caution that many of them are small, and quality control is very variable. In the next few years, assuming that the new UK FFC process scales up as its developers believe it will, costs of basic titanium sponge should drop by a further 25% to 50%.

The FFC process, unlike the present day Kroll process, in which molten metallic magnesium is used to reduce titanium tetrachloride gas to titanium sponge in stainless steel retorts, makes titanium oxide the cathode of an electrolytic cell with a molten calcium chloride electrolyte and a graphite anode. The oxygen is then taken away from the oxide, leaving titanium sponge behind. The process, which was the brainchild of Professor Derek Fray, Dr Tom Farthing and Dr George Chen, at the University of Cambridge, is now well beyond laboratory scale, and a pilot production cell is to be commissioned at the premises of developer Metalysis, about the same time that this article appears in print.

Demand for titanium and its alloys is driven by their extreme corrosion resistance, their strength to weight ratios (which are about double those of the best steels), its suitability for use in the human body, and its springiness. Titanium alloys have half the Young's Modulus of high strength steels, which means that they can bend more before deforming.

This makes them the ideal material with which to make springs, according to Graham Fowler, technical manager of United Springs in Rochdale. Because they bend more elastically than steel, they can be made with half the number of coils, as well as being half the weight per unit length of metal, making a titanium spring one quarter the weight of its steel equivalent.

The only problem is that heat treatment is critical, and they are expensive to manufacture in small volumes because processing is special. They have been used in rally sport for years – United Springs makes titanium coil springs for Citroen rally car suspension units that cost £600 each. However, according to Dr Alan Catchpole of the Titanium Information Group at Namtec: "One of the new production Volkswagens is starting to use titanium springs." He also pointed out that its springiness makes

Testing the metal

Products routinely made of titanium alloys take advantage of their corrosion resistance, high strength per unit weight, relatively low Young's Modulus, excellent fatigue resistance and non-magnetic properties. Current uses include: medical implants (especially for skeletal repair, dentistry; and to keep arteries open); armour plate; high-performance springs; aircraft parts; valves and other parts for high-performance cars and motorcycles; bicycles; corrosion-resistant parts and heat exchangers for oil and gas and chemical plants; risers for the offshore oil and gas industry; gears in robotic servos; robotics generally; heads for golf clubs; and jewellery that does not tarnish.

Titanium components can be produced more quickly using the new EOS M270 SLS machine

titanium risers a favourite with the offshore oil and gas industry because the titanium pipe can be reeled off a ship without risk of its becoming permanently deformed.

In the medical field, many people are being kept alive by nickel titanium stents holding open their arteries, but for skeletal repairs and implants, Dr Catchpole said that there is now a move away from '6-4', the most common titanium alloy with 6% aluminium and 4% vanadium to '6-7', where the vanadium is replaced by 7% niobium, which is thought to be slightly better for human health. At the same time, he said, manufacturers are now looking at manufacturing porous titanium alloy implants, so that bone can grow into them. He also pointed out: "Headway is being made with making them using powder metallurgy."

While traditional powder metallurgy manufacture of titanium parts remains expensive, EOS has brought out a new version of its M 270 selective laser sintering (SLS) machine suitable for making parts out of either pure titanium or 6-4.

The Eosint M 270 can either use nitrogen in its build chamber or argon. The latter gas is ideal for laser sintering titanium and a new filtering system has been incorporated that removes titanium condensate during the build process, which was a problem with earlier models. Titanium powder is processed in 30µm thick layers. Users include the UK division of Airbus, 3T RPD in Newbury, and the Department of Engineering and Technology at the University of Wolverhampton.

Dr Mark Stanford, responsible for R&D, using what was originally an older M 270, upgraded to the new specification, reports that surface finish is now two to three times better: 4 to 5 Ra instead of 10 to 12 Ra and scanning speed is up to three to four times faster: 350 to around 1200 mm/s. In addition, the components produced using the new machine are homogeneous and fully dense throughout, regardless of the length of the build cycle.

Design Pointers

- The cost of titanium alloys is coming down and they should become even cheaper within the next few years
- One solution to fabrication costs incurred following traditional routes is to turn to Selective Laser Sintering, where technology applied to titanium alloys has recently been greatly improved
- New titanium alloys continue to be developed as alternatives to 6-4, either to reduce costs or improve performance
- Titanium springs can be a quarter the weight of their steel equivalents

Research into titanium's value for armour plate has also produced cost savings. Indeed, it was work on this by defence researcher QinetiQ that got the FFC process under way. ATI Allegheny in the US has also developed several interesting new products in its quest to develop better and more cost-effective armour plate.

ATI's 425-MIL was originally conceived of as a lower-cost alternative to 6-4, with iron replacing some of the more costly vanadium as a beta phase stabiliser. Among its advantages is that, unlike 6-4, it can be cold worked relatively easily. It can also be welded and is super plastic formable at 830ºC to 900ºC at a strain rate of 30,000/s. Its corrosion resistance is similar to that of 6-4 and 3-2.5 in marine environments and to that of many media used in the chemical process industry.

One type of titanium alloy that has until now only found use in some automotive and aerospace applications is titanium aluminide. This has very good oxidation resistance and good mechanical properties over 600ºC, while being half the weight and much less costly than nickel superalloys. The only problem with such alloys is their low ductility and the low reproducibility of their microstructures.

Research undertaken by G. Angella and colleagues at the IENI-CNR Institute in Milan as part of the EU IMPRESS (Intermetallic Materials Processing in Relation to Earth and Space Solidification) project showed that the microstructures can be greatly improved by the presence of 8% niobium. The main aim of the project is to produce a 40cm long titanium aluminide intermetallic, low-pressure gas turbine blade. General Electric has already announced that gamma titanium aluminide low-pressure turbine blades are to be used in its GEnx engine.

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Magnetised shafts measure torque by field

Tom Shelley reports on a truly non-contact method for measuring torque

A non-contact measuring system sensitive enough to detect torque applied by hand pressure that has become established in Formula 1 motorsport, is beginning to find additional applications in industrial condition monitoring.

Developed by NCT Engineering in Unterhaching near Munich, the sensor was invented by Lutz May, and uses Pulse Current Modulated Encoding (PCME) technology to magnetise drive shafts.The sizes of the shafts can range from dental drills to drive shafts in ships and even oil drill shafts. Thus far, most experience with the sensor has been gained in gearbox shaft and power tool drive shaft applications, where reliable and repeatable measurements have to be taken under extreme conditions and at very low costs. That said, the sensor has been used for R&D in everything from power supply applications to the testing of consumer goods.

The unit depends on the inverse magnetostrictive, or Villari, effect in which there is a change in domain magnetisation when a stress is applied to a material. This can be positive (magnetisation increased by tension in iron) or negative (magnetisation decreased by tension in nickel). It responds only to force and does not require the shaft to distort.

Best response is achieved when the nickel content of the alloy used to make the shaft is greater than 1.6% and chromium is also present. In addition, where the PCME sensing technology is applied should be dimensionally symmetric and hardened as a non-hardened sensing region produces large measurement hysteresis. The minimum axial width that can be encoded is 25mm, although 50mm is preferred. The minimum radial spacing between the shaft surface and the sensing coil unit is 5mm, although 10mm or more is preferred.

One of its advantages, according NCTE's sales manager Joachim Heckler, is that it can be used at high temperatures – nearly 485ºC in the case of the shaft. The pickup coil or 'secondary sensor unit' (the encoded shaft is the 'primary' sensor) is able to cope with temperatures of up to 210ºC, or 250ºC in the short term. The signal condition and signal processing electronic unit is about the size of a matchbox and can be incorporated into other equipment.

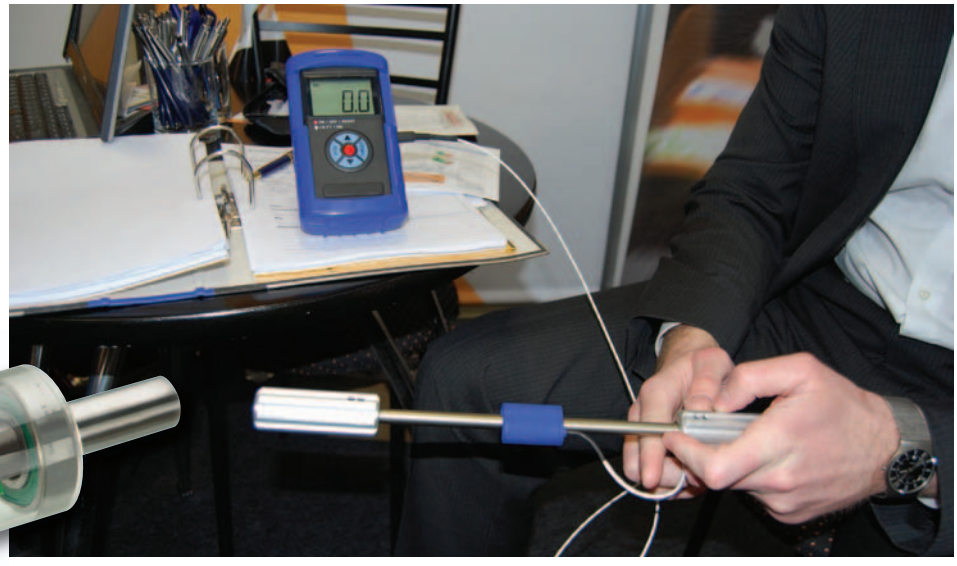
Heckler describes the system as 'very robust and very stable', being able to withstand vibration levels of more than 1000g in all three axes. The magnetisation of the shaft is very low, meaning it does not pick up debris. Signal bandwidth is 30kHz, which accommodates shaft rotations of more than 200,000 rpm. Signal resolution is 0.01% and repeatability is 0.05% for many applications.

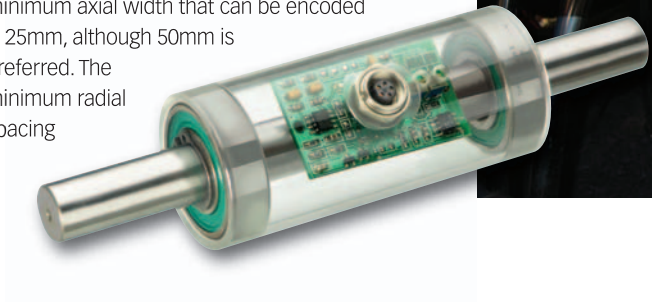
The applications have included testing helicopter gas turbines and gearboxes, studying breakaway torque forces in an impact power tool bit holder, measuring drilling shaft bending and torque forces down oil boreholes, measuring torque forces in avionic flap control, and measuring torque forces in F1 KERS systems. However, the business is now moving into more routine industrial applications.

www.ncte.de

Design Pointers

- System allows the direct, non contact measurement of torque and force from changes in the magnetisation of a steel shaft or bolt under the influence of applied stress
- Although previously used for R&D and F1, NCTE is moving the sensor into more routine industrial applications
- Signal resolution in many applications is 0.01% full scale and measurement repeatability 0.05%. Signal bandwidth is up to 30kHz analogue and electronic unit current consumption is less than 10mA





Ultrasonic flowmeter appeals to new markets

A new high-accuracy, low-cost ultrasonic flowmeter could represent a breakthrough in small bore flow metering. Paul Fanning reports.

Due to be launched at Mtec 2010, the Atrato from Titan Enterprise is a direct through meter without a contorted flow path. The device uses ultrasonic technology and can handle flows from laminar to turbulent. Because of this, it is said to be largely immune from the effects of viscosity. The supplier claims excellent turndown, linearity and repeatability for the part.

The Atrato is capable of monitoring flow over a range of 200:1 and has accuracy better than ±1.5%. Its simple design is said to make it marketable, while a USB interface makes it easy to install and use.

This device uses the favoured 'time of flight' measurement system, in which a signal is passed along the pipe with the flow and back up the pipe against the flow. With no flow, the signals are identical; when there is flow, thetime difference between these signals is proportional to the velocity of the liquid. As the pipe geometry is fixed and known, the throughput of the liquid can be calculated.

Titan's founder Trevor Forster has championed the technology for some time. "Fundamentally, my position is that the future of flow measurement is going to be ultrasonic or Coriolis based. They're the only two long-term viable technologies because they're non-intrusive."

However, until now, both technologies have been seen as expensive and – in the case of small-bore ultrasonic flowmeters – not particularly accurate. For these reasons, small bore ultrasonic flowmeters have tended to be restricted to medical applications. However, the Atrato's ability to achieve timing accuracies equivalent to 200picoseconds at between 25 and 50% the cost of other ultrasonic options could change this.

At the heart of the Atrato is its use of a different sensor arrangement and advanced signal processing to interrogate the flow, ensuring that that it provides high accuracy over a wide turndown range. Although preferring to maintain the signal processing as a 'black art', Forster is happy to discuss the patented sensor arrangement. "We're using an annular crystal. What we're looking to do is to excite the crystal across the radius. Normally, when you excite a crystal, you get a natural frequency and the movement goes across the width. We're exciting it in such a way that we're getting the movement radially, which puts a very, very strong signal directly into the fluid. The method of driving and receiving we use ensures that the resulting signals are identical and, at zero flow, the upstream and downstream signals cancel each other out."

This process offers the technology a number of advantages. Says Forster: "Because we are introducing the signal radially and receiving it radially, we've effectively got a plane wave travelling down the pipe, so we don't have contorted parts or reflected signals. This also gives us a signal to noise ratio of up to 3000:1, which is why we can handle such a wide flow range."

Because the signals are travelling in a plane wave, they are insensitive to the velocity profile. Indeed, running the meter on a 380 centistoke oil gives almost identical performance to running it on water. Naturally, this makes it adaptable across a number of markets. Applications which Forster believes will be of particular interest include pilot plant, research laboratories, medical and low industrial flows.

However, Forster sees another potential market in domestic water meters. "We are looking for partners for the domestic water meter market. We're well within the flow range and performance level for domestic water meter. We're out on cost, but then we're not building 20 million a year, which is the anticipated market in a few years time!"

www.flowmeters.co.uk

Shows focus on the future

With seven shows covering all facets of the subject, Advanced Manufacturing 2010 (co-located with Medtec 2010) has a lot to offer.

Taking place at place at the Birmingham NEC on 27 and 28 April, Advanced Manufacturing 2010 will comprise seven co-located shows which promise to deliver an accurate reflection of what's available from suppliers to the UK's advanced manufacturing marketplace.

Amongst these will be **Mtec**, the UK's only event dedicated to instrumentation and techniques for practical measurement as required in control, engineering, processing, physics, chemistry, utility and the life sciences sector.

Machine Building and Automation is the recognised event for products, systems, components and services used by the machine building and advanced manufacturing industry in the UK and Ireland. Showcasing the next generation of automation techniques and equipment, MB&A seeks to give a view of the future of UK manufacturing.

VTX or Vision Technology Exhibition targets expert and potential users of vision systems in UK and Irish industries. The event has cross-industry support and will bring together the major manufacturers, distributors, users and potential new users in an exhibition and free conference format.

3C, or Contamination Control and Cleanrooms, is the must-attend event for the protection and prevention of particle infection to personnel, products, or the environment. Here, visiotors will see leading UK-based suppliers of cleanroom technology, associated products and

MEDTEC

STAND 2005

Miniature Hexapod System on Display at Medtec

A new miniature Hexapod six axis positioning robot appropriate for micromachining and micromanipulation tasks will be on display on the PI (Physik Instrumente) Ltd stand at Medtec.

The palm sized system which is only 100mm in diameter, can provide a positioning range of up to 40mm in the X and Y axes and 13mm in Z. Up to 60 degrees of rotation is possible in the theta Z axis. The system is supplied with controller and a range of software tools that allow the user to perform complex movement tasks.

PI
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www.pi.ws

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MEDTEC

STAND 1500

Parker Hannifin exhibits revolutionary solutions for medical sector.

Parker Hannifin, the global leader in motion and control technologies, will be showcasing its latest products, systems and services designed to improve performance, productivity and profitability in the medical and life sciences sectors at MEDTEC 2010. In particular, Parker will be unveiling its latest range of pneumatic fittings, electromechanical drives and high performance seals, in addition to launching its rapid prototyping services at this year's exhibition and conference.

Parker

www.parker.com

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Mtec

STAND 1340

I7000
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Mtec

STAND 1251

Established in 1978, Relec offers a range of advanced sensing technology solutions for process, industrial and automation applications. From object detection/ position to liquid, gas and bulk solids, we supply sensors for fast accurate measurements that you can rely on. We also offer an extensive range of power and panel products.

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services. Update your expertise at free seminars on a wide range of contamination control and cleanroom-related issues.

Practical Vacuum 2010 is the principal event for all aspects of vacuum technology. The event features an invaluable free educational seminar programme and attracts key vacuum users from industries and academia in the UK and Ireland.

This year, **Medtec UK** will present all the latest technologies and tools for medical device manufacturing.

With focused display areas for high-tech manufacturing, packaging, materials, automation and design, Medtec UK will present all the technologies and tools that medical device manufacturing professionals need to become and/or remain world class.

Exhibitors at this annual event will be complementing the Medtec Conference Education and Innovation platform with targeted displays within several special feature areas.

Precisiontec will display multi-axis CNC technology, micro-machining, EDM technology, lasers and ultrasonic technology for the manufacture of surgical devices, implants and interventional cardio devices from speciality medical alloys.

Medipack offers materials, outsourcers and machinery for the packaging of medical devices and manufacture of pharmaceutical drug delivery systems, while the Biomaterials platform will exhibit high-performance plastics, injection moulding and extrusion techniques for medical manufacturing.

The Automation, Assembly and Robotics area will showcase the integrators and latest technology for automated production and assembly techniques, while Medidesign will feature design companies that specialise in the medical device market.

The conference itself will this year include a

conference programme on the show floor for visitors to take advantage of. Led by academic and industry experts, the two-day Innovation Forum will showcase research & testing capabilities from pre-clinical testing facilities and materials analysis to the latest advances in cardiovascular and orthopaedic research. The 30-minute presentations will include floor discussion and visitors will be encouraged to ask questions.

The Conference's areas of focus will include:

- The challenges and solutions in managing the implementation of the Directive for EU and globally marketed products, including 'New obligations for clinical data' and 'How the Directive is interpreted by manufacturers, authorities and notified bodies'.
- FDA and CDRH policy changes and their impact on getting products to market in the USA.
- Quality and risk management strategies throughout product development.

There will also be a series of hard-hitting presentations from senior executives of leading medical device companies.

The Conference programme is targeted, in particular, at all levels of medical device industry management, regulatory and compliance management professionals, quality engineers and risk management experts, as well as product development specialists.

The Medtec UK Conference will this year be complemented by the Medical Device Innovation Technology Forum (MDIT Forum). This new Medtec education feature is designed to bring key professionals in the medical device sector completely up to date with market analysis and commercial opportunities, as well as the latest research and technology developments, including clinical viewpoints and academic research.

Rofin's EasyMark and StarWeld Select systems will be on display at Medtec 2010

The Forum is intended to foster closer ties between UK institutions and industry to further the development of medical devices on a global scale.

Key areas of focus for the 2010 Forum include: Commercial opportunities in the global medical device industry; Trends and developments in the medical device industry; Innovation of devices for drug delivery; Innovation in devices for trauma management; Presentation of research by British institutions; Review of commercial opportunities Clinical, academic or industrial research projects; Technology; including materials, product design and development, case studies, new or innovative manufacturing technology or techniques, process automation and green manufacturing.

www.advancedmanufacturinguk.com
www.medtecuk.co.uk


PI's new miniature hexapod six-axis positioning robot, appropriate for micro manipulation tasks, will be shown

Mtec

STAND 1210

Lumasense Technologies is a global supplier of Temperature and Gas sensor technology and will be showing the complete range of Lumasense Brands at the Mtec exhibition in April.

IMPAC: Infrared Thermometry

MIKRON: Thermal Imaging and Blackbody Sources

LUXTRON: Fluoroptic Thermometry

INNOVA: Gas concentration monitoring (PAS)

ANDROS: OEM Gas concentration monitoring (NDIR/DIR)

LUMASENSE TECHNOLOGIES

www.lumasenseinc.com

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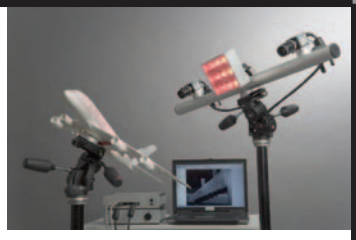
Mtec

STAND 1459



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Mtec

STAND 1420

Micro-Epsilon (UK) Ltd will be showcasing its complete range of displacement measurement sensors and non-contact temperature measurement products, including a brand new range of short wavelength infrared temperature sensors, a low cost compact ratio pyrometer for OEMs, and a range of handheld and inline thermal imagers.

Micro-Epsilon is proud of its high investment in R&D, which enables the company to develop innovative, high performance sensors, which measure displacement, distance, position, vibration, dimensions, thickness and temperature, using contact and non-contact techniques, including 2D/3D laser optical, confocal chromatic, eddy current, capacitive, inductive, draw-wire/string pot and time-of-flight sensors.

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VTX

STAND 1540

Alrad Imaging preview products to be shown at VTX 2010.

On the Alrad stand No 1540 you will find the latest technology products for Machine Vision and Imaging applications. These will include the Cyclocam high speed camera, e2v linescan cameras, FGPA boards, mvBlueCOUGAR-X intelligent camera, Sentech compact GigE Vision cameras, industrial lighting, lasers, frame grabbers and image sensors and sockets.

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READER INTERVIEW

60 SECOND

Paul Lewis
Design Engineer
Penny & Giles Controls

Q How did you first get into the engineering industry?

A In a way, you could say that I've been in engineering since I was 11 years old. I went to a technical secondary school and went straight into industry from there. Strictly speaking, of course, I was 17 when I left school and started an engineering apprenticeship. But engineering was always something that interested me.

Q What does your role with Penny & Giles involve on a day-to-day basis?

A I generally do a bit of everything on the design side, although at the moment I deal more with changes, upgrades and reviews of products than anything else. However, if I'm required to work on anything else, I'll obviously do that.

Q What are some of the projects that you are currently working on?

A The latest thing we're working on is a potentiometer for the Hawk aircraft. Penny & Giles has always been heavily involved in the aerospace sector and we have another ongoing project in which we're working on the solenoids for a range of different aircraft that are coming up for review.

The solenoid designs that I'm working on at the moment are generally for older aircraft, dating as far back as the 1980s.

Q What is the most interesting project/piece of engineering you've been involved in?

A There have been a fair few interesting projects over the years, but one of the most interesting for me was designing a big tow truck that was used for towing aeroplanes at airports. Although I believe the company itself has closed down now, I understand the trucks are still in use at Bristol airport and a couple of other airports as well.

From my point of view, it was interesting because I'd never done anything like that before. Prior to that project, I was working on production equipment, like conveyors and so forth, so it made a big change for me.

Q Has the industry changed a great deal since you joined?

A Yes, it's changed very much. The main difference is that now it seems so much more controlled: there's more paperwork, more control and much more in the way of regulations and directives.

I appreciate that a lot of these regulations do improve things, of course, but it just seems to me that there's an excess of it. These days, it seems as though everything's covered by rules and regulations.

It's interesting, in fact, looking at these solenoids that I'm working on and comparing the work that we have to do to review them now with the work that was done – by which I mean the different types of drawings and everything – when they were first made.

The truth is that, these days, we just wouldn't get away with a quarter of what they did back then!

Q What are the big issues facing your industry?

A Unfortunately, I think the biggest issue is the lack of engineers. It's just become so hard to recruit qualified people as there are just so few young engineers coming through, either from within the business or generally. And the sad fact is that I don't think the Government takes engineering seriously enough, which doesn't help.

I suppose, though, if you look on the bright side, with all the need for renewable energy and the need for ecologically-sound technology coming through, things will start to change, because they're going to need engineers for that.

Q How do you see the industry going forward?

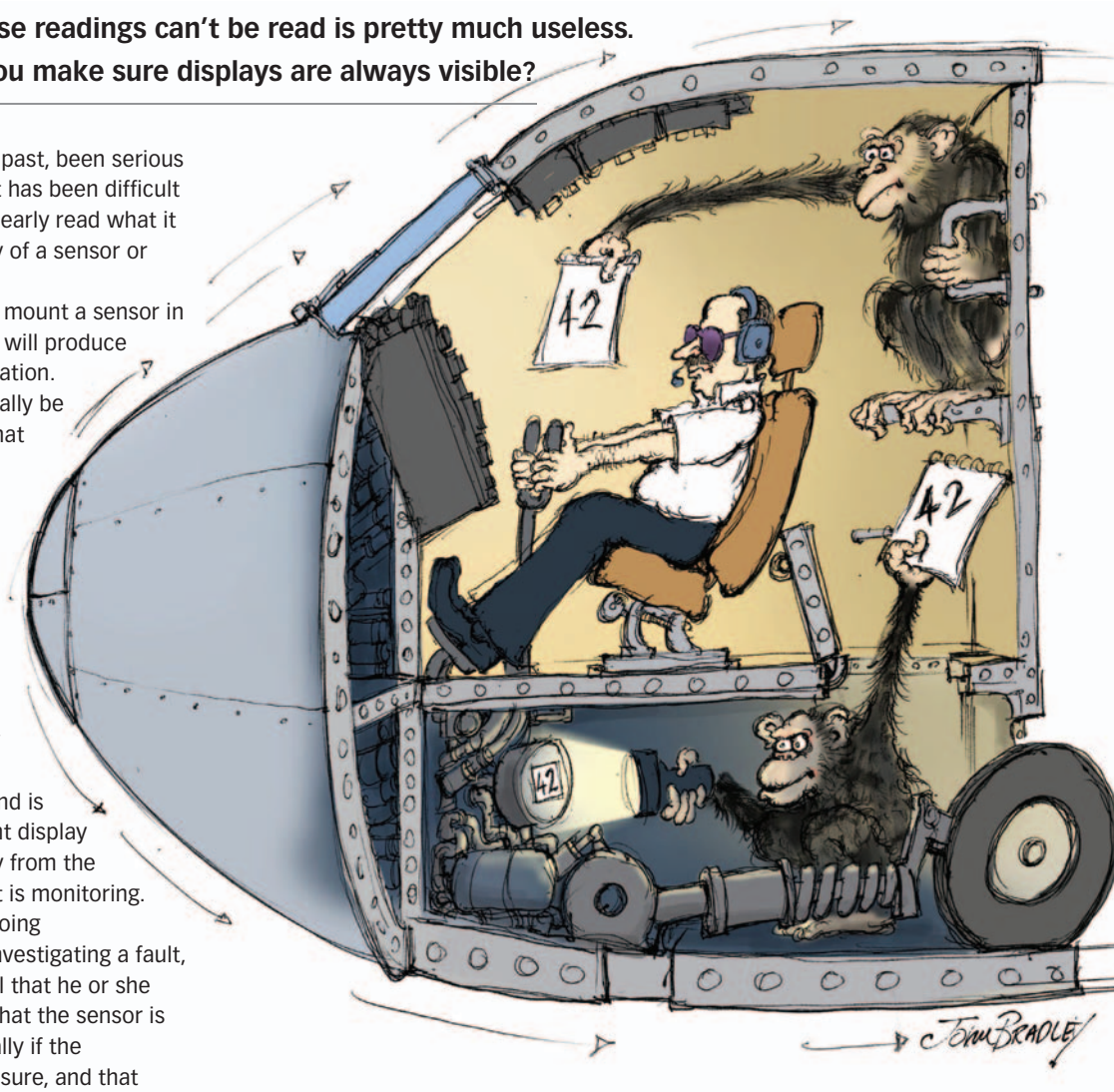
A I think that, as the country and the world become more and more technical and technology becomes an everyday part of everyone's life, the industry is going to become even more technical.

As a result, people working in the industry are going to have to become more and more qualified just to keep up with developments.

Got an interesting project? To be considered as a future 60-second interview candidate contact: pfanning@findlay.co.uk

Seeing clearly

A sensor whose readings can't be read is pretty much useless. So how can you make sure displays are always visible?



There have, in the past, been serious accidents where it has been difficult or impossible to clearly read what it said on the display of a sensor or instrument.

It is sensible to mount a sensor in the place where it will produce meaningful information. Telemetry can usually be relied on deliver that information to the control system or instrument panel where it has to be made use of. There are, of course, limitations to this.

The first is that the telemetry may not always be working. The second is that the instrument display may be a long way from the sensor and what it is monitoring. If a technician is doing maintenance, or investigating a fault, it may be essential that he or she can at once see what the sensor is indicating, especially if the measurand is pressure, and that pressure is either so low or so high that something undesirable is liable to happen quickly.

There then comes the problem of reading the display in what may be quite an inaccessible place. It may be facing the wrong way, or is perhaps upside down, which, while still legible, is liable to lead to a misreading and any number of highly undesirable consequences.

The Challenge

Our challenge this month is to come up with a way of ensuring that a display on a pressure gauge can always be easily read. The solution could be optical, some kind of light pipe, or involve trained snakes that could go in and curl round and read it – if they could be relied on to deliver an accurate account of what they saw.

On the other hand, the solution could be electronic, with the sensor delivering a message to the technician's PDA.

All of these, however, involve some kind of added expense or complexity, when what is best, as always, is something simple, reliable and cheap.

The solution is based on not one, but three pieces of lateral thinking. Once you see them, you may consider them to be obvious, but to our knowledge, most pieces of sensing equipment do not have these features, although we are sure that they will quickly become commonplace. An improvement has already been suggested, so we invite you to see if you can come up with something better.

The answer to last month's Coffee Time Challenge, how to stop wires getting trapped by electrical enclosures, can be found in our Technology Briefs section on page 11

www.beeas.co.uk

Rise to the challenge

Entries for the British Engineering Excellence Awards are now open!

Give your design projects the recognition they deserve.

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Training

Spirax Sarco has expanded its training schedule in 2010, adding four new courses and extending another

Highlights include new modules on controls and heat exchanger applications, combustion efficiency, metering and Boiler Operation Accreditation Scheme (BOAS) Refresher course.

Expert training from Spirax Sarco can help steam users to identify efficiency improvements and gain significant energy savings from their existing steam and condensate system.

For a free copy of the 2010 schedule or any of your training needs contact Kim Mansfield, Training Coordinator, on 01242 535211, or email Training@SpiraxSarco.com

Alternatively, visit www.SpiraxSarco.com/uk/training

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Coatings

WS2 Stops galling of SS and Titanium

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

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

Design Out maintenance problems with WS2!

www.ws2.co.uk

@: sales@ws2.co.uk
✆: 01430 861222

Enclosures

Multi-Function Desk and Wall-Mount Enclosures

The new INTERFACE-TERMINAL enclosures, from OKW, have been designed for fast assembly of desktop and wall mounted electronic systems. Moulded in off-white ABS, these enclosures have a modern contoured shape with external dimensions of 190 x 135 x 95 mm (S), 225 x 165 x 104 mm (M) and 275 x 195 x 120mm. The top section has been designed for mounting membrane keypads, large LCDs or touch screens.

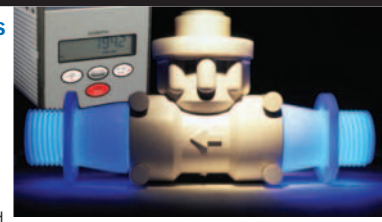
To learn more visit:
www.okw.co.uk/interface-terminal

www.okw.co.uk

@: sales@okw.co.uk
✆: 01489 583858

Flowmeters

Control of chemical flows



The rugged Titan Metra-Batch plant or panel mounted controller offers low-cost batch control, blending or tank filling of chemicals, food ingredients, beverages, fuels and solvents. The 8 digit display can be selected to show the current batch delivery total, flow rate, or total product consumption, and can transmit totaliser and rate of flow data for remote monitoring. The turbine flow sensor from the Titan FT2 range is constructed from chemically resistant PPS engineering plastic; units for 10 flow ranges cover the flow range 0.01 – 160 L/min, at up to 15bar and 80C.

www.flowmeters.co.uk

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Speed Controller

Efficient speed control for high power DC motors

New, from an ever-expanding range of DC control products, the Electromen EM-285 speed control gives accurate speed holding for motors up to 20A rating.

As an addition to the existing EM-185 this new introduction gives the same versatility to larger DC motors.

Common features for both **EM-185 & EM-285**:
- Stand alone speed controller
- Compact Panel mounting
- 10 to 25Vdc (12 and 24V motors)
- Variable current limit
- Load compensation

Unique features
EM-185 • 3A continuous rating, 6A peak
EM-285 • 20A continuous rating, 30A peak

www.oem.co.uk

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✆: +44 (0)116 284 9900

Imaging

New Imaging and Machine Vision Handbook

The 4th edition of STEMMER IMAGING's extremely popular Imaging & Machine Vision handbook is now available. Packed with over 50% more pages than Issue 3, and including improved technical overviews and easier to use selection guides, the latest edition is being printed in German for the first time as well as English. It is available free of charge in the UK, France, Germany and Switzerland.

The handbook is an extremely useful guide to machine vision. The comprehensive 'technology overviews' featured in each section not only explain clearly how the products work, but also show how they can best be applied in machine vision systems.

www.stemmer-imaging.co.uk

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Electrical Enclosures

www.anixtercomponents.com

Anixter Component Solutions Launches New Ranges of Electrical Enclosures

Anixter Component Solutions announced today that it has released several new ranges for electrical enclosures. These include five new versatile ranges of electrical enclosures and introduced four new ranges of ventilation plugs for use in electrical enclosures.

The new electrical enclosure ranges include more than 100 size combinations moulded from high-performance polycarbonate and ABS materials. Options for the ranges include opaque or smoked transparent lids, solid wall or integral knockouts for cable glands. Many of the enclosures provide ingress protection to IP67 and impact protection to IK08 and are rated for temperatures up to 120°C.

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ULTEM 9085 for Rapid Prototyping

www.laserlines.co.uk

High performance thermoplastic now available for use with Direct Digital Manufacturing & Rapid Prototyping systems from Stratasys.

Because ULTEM 9085 is certified for use on commercial aircrafts, manufacturers can now bypass a lengthy certification process. The material is available for Stratasys' top two additive fabrication machines – the FDM 900mc™ and FDM 400mc™. Until today, ULTEM 9085 was available only for conventional manufacturing methods. The material was originally developed to help the aerospace industry boost fuel efficiency and safety. It offers strength and flexibility while producing 5 to 15 percent lighter interior parts than other aerospace plastics.

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Pressure Transmitters

www.sick.co.uk

SICK expands pressure sensor portfolio

SICK has added a new pressure switch to its industrial instrumentation product offering. The new PBS combines the functionality of a pressure transducer, a pressure switch and display in a single cost-effective, easy-to-use package.

Darren Pratt, UK instrumentation product specialist, SICK, commented: "The PBS pressure switch is very easy-to-install, making it a plug-and-play solution. It also has the advanced functionality to integrate with modern plant supervisory control and data acquisition (SCADA) and network communications."

The PBS pressure switch is part of SICK's growing range of Industrial instrumentation solutions including level, pressure, flow and temperature sensing.

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Pressure & Temperature Measurement

www.wika.co.uk

New WIKA pressure transmitter C-2 - specifically for air compressors

WIKA has developed the new C-2 pressure transmitter for pressure measurement in screw-type, reciprocating and turbo compressors. It features a particularly robust and compact design and an exceptional price/ performance ratio.

With the C-2, compressor manufacturers and manufacturers of measurement and control components for compressors will get a high-quality pressure transmitter that is optimally matched to the requirements of the market.

Measuring ranges from 0 ... 6 up to 0 ... 60 bar, along with the established output signals and electrical connections, meet the standards usual in the market. For further technical details a data sheet can be requested from WIKA.

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Sensors

www.sensortechnics.com

High Accuracy HDI Pressure Sensors Offer 3 V Supply Voltage Versions

Sensortechnics' HDI sensors measure absolute, differential or gage pressures in various ranges from 10 mbar up to 5 bar. The HDI series features 3 V supply voltage versions which are ideally suitable for battery powered applications, e.g. in portable or handheld devices. HDI pressure sensors perform precision digital signal conditioning and achieve ultra high accuracies with an excellent Total Error Band (TEB) better than ±0.5 %FSS over a temperature range of 0...+85 °C.

The HDI series provides digital interfaces with I²C bus protocol and analog 0.5 ... 4.5 V output signals at the same time. All HDI pressure sensors can be modified according to customer specific requirements, e.g. with respect to pressure range, resolution, accuracy and internal digital settings.

@: uk@sensortechnics.com
✆: 01788 560426

MEDTEC UK

www.medteculkshow.com

The Premier Showcase for Medical Device Technologies

Visitor registration is now open to this year's MEDTEC UK (Birmingham NEC, 27-28 April), the UK's premier medical device manufacturing forum that provides design and manufacturing professionals with the annual showcase of the leading suppliers of raw materials and the latest manufacturing, automation technology and outsourcing technologies and tools that will help them make/retain their world-class status. Also featuring the renowned MEDTEC Conference and the new Medical Device Innovation and Technology Forum.

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Temperature Measurement

www.abb.com/instrumentation

Daisy & Co ensure paper-free production with ABB SM500F

Somerset based Daisy & Co are ensuring paper-free, transparent production in their pasteurisation following the installation of an ABB SM500F videographic recorder.

The SM500F is an electronic data recorder that can be installed anywhere, taking recording out of the control room and offering users localised access to operational data.

The SM500F enables Daisy & Co to continuously track what is happening in each process and allows them to conveniently store data for future reference. In a highly regulated industry the recorder offers efficient and constant transparency whilst reducing incidents of wastage due to product irregularities.

@: moreinstrumentation@gb.abb.com
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Test & Measurement

www.mecmesin.com

Mecmesin Lifts The Lid On Wine Closures

Mecmesin, a force and torque test equipment manufacturer, has entered the winery industry, enabling producers to test components, from wine closures to packaging materials, in order to minimise the risk of tainted wines and leakage, whilst guaranteeing easy opening by the consumer.

Closure manufacturers, such as Oeneo Bouchage and CSA Australia, and wine producers, such as Orlando Wyndham Group, are using Mecmesin testers to fully assess their production methods and materials to determine their efficiency, quality and, ultimately, produce a better and more consistent standard of product to meet in-house and customer expectations.

@: sales@mecmesin.com
✆: 01403 799979

Motors | Energy | Automation | Coatings

W22 Three-Phase Electric Motor. Designed for today. Protecting tomorrow.

With electric motors accounting for around 40% of global energy consumption, the world is demanding a truly efficient globally recognised industrial motor. The new W22 motor range meets all global efficiency standards including the European IE 1, 2 and 3, North American NEMA Premium and Australian MEPS. The W22 has been designed, using state-of-the-art engineering, with efficiency at the forefront – from the design of the frame to maximise heat dissipation, ease handling and assist maintenance, to the multi-position diagonal cut terminal box for better cabling access.

The WEG W22 is what the industrial world needs today, to help sustain its future – tomorrow. Visit www.weg22ways.net to find out more.

Contact us for a **FREE** copy of our **22 Ways to Improve Motor Productivity and Prolong Lifespan** booklet

Call: **0800 862 0375** Email: **22ways-europe@weg.net**