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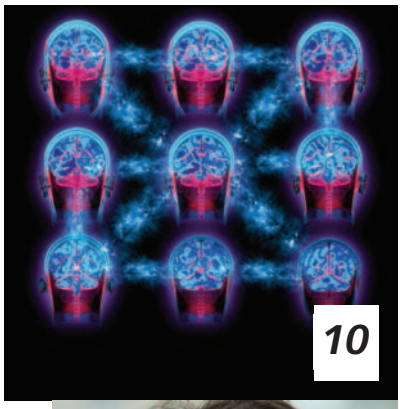
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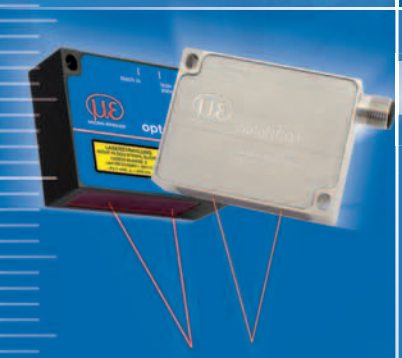

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Overcoming the 'boffin' cliché

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

Lord Sugar's recent assertion that he had never come across an engineer able to turn their hand to business has been so thoroughly and deservedly debunked by so many different and illustrious bodies that it is superfluous for me to add my voice to the chorus of disapproval. Instead, it is perhaps more instructive to examine the reasons why he would hold (and apparently feel justified in vocalising) such a prejudice in the first place.

To start with, of course, such a view is an inevitable consequence of a lazy stereotype that casts the engineer as a 'boffin' (invariably male), obsessed to the point of tunnel vision with the problem in hand and unable or unwilling to deal with any real-world issues that extend beyond his narrow, technological concerns.

Of course, it does not take more than a moment's thought to summon up examples that counter this stereotype, but that doesn't stop it being a persistent and pernicious image that bedevils UK engineering. In part, perhaps, this is because it is an image that has been reinforced by the fact that companies were organised for so long in such a way that engineers were separate from the 'business end' of the company, thereby turning this stereotype of the engineer into a self-fulfilling prophesy. And, perhaps, it is even true that this state of affairs may have suited some (but by no means all) engineers?

However, the days when functions like marketing, finance and even manufacturing existed 'over the wall' from design engineers are long gone. No-one can afford ivory towers any more. As a consequence, engineers not only can successfully turn their hands to business, they are doing so every day.

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Minister challenges engineering to 'wow' young people

UK engineering chiefs gathered at the Department for Education on Wednesday 8 June to discuss what can be done to ensure the talent pipeline and adequately equip young people for the requirements of industry.

Organised by EngineeringUK, Schools Minister Nick Gibb MP addressed a high-level roundtable attended by representatives from EngineeringUK, E.ON, BAE Systems, JCB, Jaguar Land Rover, Ford of Britain, the ODA, GKN, Rolls Royce, ICW UK, the Royal Academy of Engineering and Pearson UK.

With almost half a million engineering enterprises in the UK, employing 4.5 million people, the engineering industry is one of the most significant drivers of the UK economy today. Demand is such that the UK needs to recruit an additional 587,000 workers between 2007 – 2017; however, falling numbers of young people available to work mean that the sector must act now to identify opportunities to attract and retain engineering talent.

The Minister, said: "The Government is committed to building a robust engineering and advanced manufacturing industry in the UK. The sector forms the backbone of industry in the UK and plays a significant part in our economy. Engineers harness the forces of nature for the benefit of mankind – they can and do change the world. I hope the engineering industry can help us to encourage young people to continue to study maths and the sciences and inspire them to consider a rewarding and demanding career in engineering."

Time running out to enter BEEAs

Entries for the Awards close on 31 July 2011 and the shortlist will be announced on 2 September. The Awards will be presented at a lunch event, being held at the Globe Theatre in London on 13 October.

Intended to recognise and reward the excellence in British engineering, the Awards include categories such as Consultancy of the Year; Design Engineer of the Year; Design Team of the Year; Green Product of the Year; Mechatronic Design of the Year; Fellowship; New Product of the Year (Electronic); New Product of the Year (Mechanical); Small Company of the Year; Start Up of the Year; Young Design Engineer of the Year; and the British Engineering Excellence Grand Prix.

The Awards are open to all companies with an engineering design function and will be judged by a panel of experts. Chair of this year's judging panel is Colin Brown, director of engineering at the Institution of Mechanical Engineers. He said: "The proper benchmarking of our accomplishments is what drives all of us to higher levels and the recognition of engineering excellence is no exception. The British Engineering Excellence Awards are the national platform for providing for such recognition, allowing the celebration of the basic truth that skill, imagination and endeavour are the true ingredients for success."

For more information on the British Engineering Excellence Awards, as well as entry forms, go to www.beeas.co.uk

BRIEFS

Inverters step into servo territory

The 8400 inverter drive models StateLine, HighLine and TopLine open up new opportunities for simple through to fast and precise positioning, giving cost savings for many machines. Only where true top end performance is needed with highest dynamics is it necessary to select a servo drive. The 8400 StateLine is more than capable of handling simple positioning in which movement takes place to a limit switch, with or without feedback. Frequencies up to 20 cycles are possible.

Whilst the StateLine and HighLine operate with standard asynchronous motors, higher dynamics can be achieved by using the lower inertias of permanent magnet synchronous motors. Here the 8400 TopLine is the answer, ideally matched to the Lenze MCS servo motors and capable of resolver and incremental encoder feedback.

www.lenze.co.uk

Igus simplifies energy chains

The new E4 assembly tool range, from the energy chain specialist igus, is set to make the building of all E-Chains a whole lot simpler.

In general energy chains are easy to assemble and dis-assemble by using a simple screwdriver, however this can be time consuming, especially when access is difficult.

The igus E4 tool series has been cleverly designed to assemble the various E-Chain crossbars, whether they are standard, quicklock or swivel. Once engaged, the tool can be easily lever the crossbar into the open or closed position with one simple movement, making the process of harnessing and maintenance much easier.

www.igus.co.uk

High-sensitivity capacitive accelerometer available

A new series of single axis MEMS (Micro-Electro-Mechanical Systems) capacitive accelerometers has been launched by Kistler Instruments for use where high-precision, low-frequency measurements and compact, robust construction are absolute requirements. The new accelerometers use Kistler's K-Beam technology to deliver precision, sensitivity and low noise characteristics for a range of automotive, aerospace, OEM, R&D and general laboratory test applications.

The Type 8315A series is made up of six models with measurement rages from ±2 g to ±200 g with a frequency response of zero to 1,000 Hz (5%) in a compact design having a footprint of only 25.4 mm. The MEMS variable capacitance sensing element consists of a small inertial mass located between two parallel plates. Deflection of the inertial mass under acceleration causes a proportional change in the capacitance of the sensing element. An integrated analogue signal conditioner converts this change to a proportional voltage output. The excellent thermal stability of the MEMS construction provides reliable performance within the wide operating temperature range of -55 to +125 degrees Celsius.

www.kistler.co.uk

Split roller bearings cut downtime costs

Revolvo's SRB SN and SD series of split roller bearings offer direct dimensional interchangeabilty with standard plumber blocks that house solid bearings. Solid bearings take on average, eight- times longer to replace than split roller bearings; so by replacing trapped solid bearings with Revolvo's SRB SN and SD series split bearings when failures occur, users can achieve drastic reductions in downtime costs.

The SRB SN & SD series of split roller bearing units effectively overcome the traditional problem of replacing standard plummer

blocks with split roller units: that of the housing base to shaft centreline being higher on a split bearing, necessitating expensive modifications to machinery. They provide a simple bolt-on solution that offers full dimensional interchangeability with conventional plummer blocks, and require no structural changes to adjacent machinery.

The new bearings provide a revolution in downtime reduction and OEE. They are convenient and quick – up to 80% faster replacement time compared to solid bearings, vastly reducing the time required to change trapped bearings. In addition, they have a new design of cage clip, which is retained via roll pins to one half of the cage during assembly and disassembly.

www.revolvo.com

Solution to last month's Coffee Time Challenge

The solution to last month's challenge comes in the form of a small British designed device called a "GasGenie". This uses magnets to attache itself to the outside of a gas cylinder and senses the temperature gradient in the cylinder wall. Anyone who has used gas cylinders will be aware that the part containing gas that is still liquid is colder than the part where it is gaseous. This difference leads to a temperature gradient effect, which the Gas Genie is able to analyse and establish when the cylinder is near to running out.

The ingenious device has been developed by Product Innovation Limited, the same company that developed the Optical Level Sensor featured in Eureka in the October 2004 and May 2010 editions and the Hall Effect device featured in March 2011.

Sensors offer ultra-low pressure ranges from 25 Pa

Sensortechnics' LBA differential pressure sensors are based on thermal mass flow measurement of air or gas through a micro-flow channel integrated within the silicon sensor chip. Due to the highly sensitive measuring principle the LBA sensor achieves excellent resolution and offset stability. The LBA series now offers, ultra-low pressure ranges from 25 Pa Full Scale in addition to the existing 250 Pa and 500 Pa ranges. The LBA sensors perform fully analog on-chip CMOS signal conditioning to allow for linear and temperature compensated outputs with fast response times.

By integrating the micro-flow channel on the sensor chip level, the gas flow through the LBA sensors is decreased by several magnitudes compared to conventional flow-based pressure sensors. This extremely low flow ensures high immunity to dust contamination and condensation and allows the use of connecting tubes and input filters without the need to recalibrate or correct the output signal. Further, complex housing constructions are eliminated thus making small and cost-effective PCB-mountable devices possible.
www.sensortechnics.com/lba

Parker launches smaller torque motors

Parker Hannifin, the global leader in motion control technologies, has broadened its range of frameless torque motors with the introduction of its new TK130 models. Building on the features of the existing TK range, the new, smaller models offer simplified mechanical design, precise motion and high dynamic performance, all in an extremely robust package.

Based on proven brushless technology, the Parker TK motors have been designed for use in high performance applications requiring exceptionally smooth rotation, high positional accuracy and high dynamic performance, such as machine tool indexing and rotary tables. The robust design also makes them particularly suitable for harsh environments, including wind or water turbines, mixers, pulpers or crushers.

Delivered as kits consisting of separate stator and rotor elements with large inner diameters, the efficient and effective gearless design of the TK motors is intended to be directly integrated into the mechanical structure of the machine. The load is then directly connected to the motor's moving part, leading to simplified mechanical designs, reduced footprint and less weight.
www.parker.com

Although the invention sells well in the USA at $24.95 each, Company chairman Peter Frank tells us he is still looking for a suitable UK sales outlet.
www.gasgenie.us
www.productinnovation.com

Exploiting the social

The apparently unstoppable rise of social media has been amongst the dominant themes of the early 21st Century so far. In a mere handful of years, Facebook, Twitter and other online communication methods have gone from being the preserve of those 'in the know' to being global phenomena. It is now as normal for people to start the day by checking Facebook or Twitter as once it was to open their mail.

Given the ubiquity and familiarity of these technologies, then, it is hardly surprising that there should be attempts to harness the power of social media platforms in the world of product design and development. The potential benefits of such platforms in this context seem clear. The ability to allow engineers, project managers, and other product-development professionals to reach out to a broader network to gain knowledge and form new interest groups or communities has been a key ambition for product developers for years. So could social media be the key?

The leading engineering software companies clearly believe so, as many of them have developed or are developing products to meet this need. Although new to mechanical design, collaborative design is well-established in the software industry. So it was that in 2008, Dassault Systèmes, for instance, developed and deployed 3DSwYm (See what You mean) for its own needs as a global 2.0 intranet to the nearly 10,000 people that make up DS across 153 sites. From this experience, it believes that 3DSwYm can also allow its customers of any size to unleash the power of communities to collaborate and innovate much more efficiently and quickly. According to Jonathan Dutton, Automotive Online Community Strategy for Dassault Systemes: "They can simply and instantly create their own complete, on-the-cloud environments for social innovation. Employees, partners, suppliers, end-consumers and any other stakeholders become active participants in the innovation process, extending and enriching the innovation ecosystem."

PTC also began talking about 'social product development' in 2008, when it introduced Windchill ProductPoint, a Microsoft Sharepoint-based solution for broadening access to product information. And, while the company recently announced its intention to stop selling Windchill ProductPoint and retire the product offering by the end of 2012, it continues to enable social product development via its Windchill SocialLink product, which rolls out later this year.

Siemens, whose Teamcenter Community tool is based on the Sharepoint 2010 platform, is also making advances in this area. Eduard Marfa, the company's product definition manager Teamcenter, says the company's decision to move into this area was based in no small part on the findings of an Aberdeen Group report stating that collaboration between teams within companies was a core priority for many of its customers. He says: "We were struck by the value of

Illustration: Oliver Burston, Debut Art

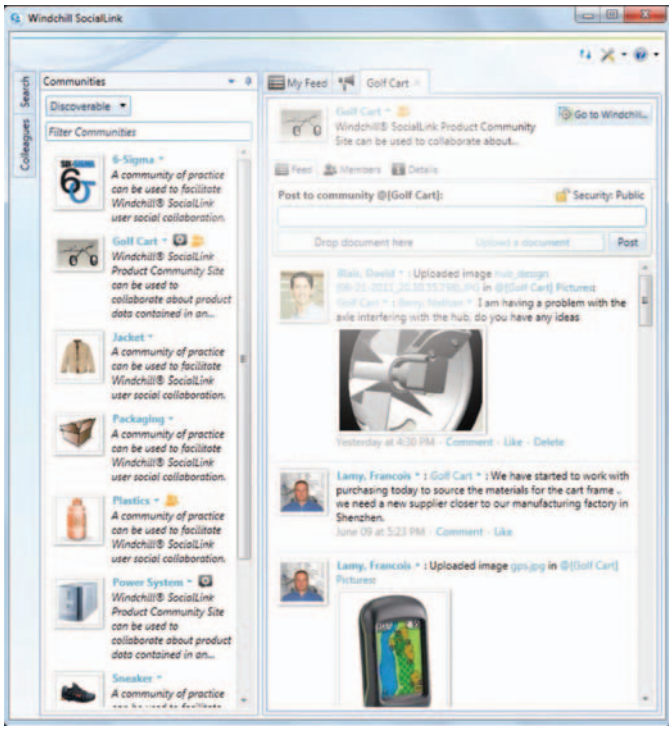
building social media applications and applying them into an industrial environment to empower collaboration across departments within companies."

Of course, enforcing collaboration between departments has long been a goal of PLM. However, one of the reasons Eduard Marfa believes that social media platforms have a role to play in making this process feel less imposed and more 'organic'. He says: "The use of this technology is helping a lot. The users are very comfortable with using all these tools and it's quite easy for users to chat and share information."

Tom Shoemaker, PTC's vice president of product marketing says: "We had been looking at it for a variety of reasons, the first of which is the sheer popularity of those tools. I would also say that there was a

network

Can manufacturing benefit from the structures and disciplines of social media? Many believe it can. Paul Fanning reports.



demographic shift that they were looking at whereby many of the workforce in engineering or related functions is approaching retirement age and managers are looking at a way of capturing their knowledge. At the same time, they have the challenge that they'll have to recruit this whole new workforce that, at the present day, is in college or high school and is used to using these technologies."

According to Shoemaker, the key concept is one of "communities of practice" whereby, people in a large organisation working on similar programmes or projects and are faced with similar challenges and problems as a result. And yet, because they are cordoned off, they simply don't know that the other person or people exist – or that there are 10 other people like them out there facing the same issues. He says: "Having a community where you could meet up with others who are working on (for instance) CFD or sheetmetal bending algorithms within an organisation – where they could sort of cross over the boundaries within the organisation or programme. That is really one of the principal things we're going for with this solution."

This is also very much what Dassault is looking to achieve with 3DSwYm. Says Jonathan Dutton: "There are two main axes where 3DSwYm can change what we do today: Process Innovation and Product Innovation. 3DSwYm enables new ways to be discovered to develop products using social networks and above all, objective focused communities, as a key driver. This in turn improves and accelerates product innovation by centralising discussions and providing 360° access to all disciplines within a company and its ecosystem."

The means whereby these 'communities' are created and how they interact is obviously crucial to their success. PTC offers a 'smart profile' that advertises and updates the skill sets of individuals within a company or community, allowing others to 'see' and access those who have the knowledge they need for a particular task or project. Says Tom Shoemaker: "By having a way to promote your skills, having a 'smart' profile that tells your organisation who you are and the sort of things you work on and having that profile continually updated or – at least – that it regularly suggest that it could be updated based on the type of work that it sees you doing. One of the problems with LinkedIn profiles or Facebook profiles or Twitter profiles is that you have to go in and manually update all of them. If a system can monitor your behaviour or activity and say 'I see that you've been doing a lot of work on sheetmetal parts and checking those into your data management system – perhaps the time is right to put those in as a skill that you have?"

Of course, many of the principles that underlie the drive towards social media have been at the heart of PLM systems for many years, something Eduard Marfa points out that many of the functions available in these social media platforms have been at the heart of PLM for some time. "We have had bits of this for many years within the Teamcenter offering," he says. "Visual collaboration has been around for a long time and the ability to share documentation and information has been in Teamcenter for more than 10 years. What's new for us is the ability to have it in one single place and now, with the capabilities

available in Sharepoint 2010, it is a much better offering."

Siemens' Teamcenter Community tool is based on the Microsoft Sharepoint 2010 platform and, says Marfa, it "allows us to leverage many of the tools we had on Teamcenter already, but the latest version of Sharepoint allowed us to 'complete the story' and make a better platform for collaboration."

According to Dassault's Jonathan Dutton, an organic approach to design is the single biggest change that this technology will bring to the role of the design engineer. He says: "It's all about keeping a dynamic going with people having common interests and goals within the same community… As projects progress so does the size of the team and each person's speciality. 3DSwYm's flexibility allows new people to rapidly become part of the community, part of the project – whilst allowing them to quickly learn and make contributions."

Christian Barr, PTC's product marketing Director, agrees that this 'organic' model offers the most exciting possibilities in terms of design, saying: "There are two ways to implement it. A structured, governance-orientated approach to defining what the relevant communities would be and working it out from a project or product point of view. But I think that the more interesting ones are the organic communities that grow up whereby you have your profiles enhanced and offers suggestions to a community of practice. It becomes a community-run activity rather than a top-down thing whereby the community is dictated as being for one purpose and one purpose only."

Barr points out there are also what he calls 'product communities', saying: "We look at the world in two ways: communities of practice that aggregate people around certain types of expertise from a professional perspective, but then there are also product communities where every team member defined as part of the product development team would have access to the community. This would play itself in terms of a conversation, an activity phase, through microblogging or various other ways of interacting. Even from a realtime problem-solving perspective in the product development, we're helping to facilitate that. So, whether you're a figuration analyst working in Windchill 95% of the time or whether you're a CAD designer in Creo/ProE, you've got a similar communication platform whereby you can connect with each other."

This is all very well, of course, but there remain serious barriers to adoption. Of these, probably the most obvious is security. Not unnaturally, companies are likely to be nervous about the idea of 'sharing' sensitive design information with a large group. Such fears are apparently groundless, though. Says Tom Shoemaker: "Whether it be web-based, via desktop client or enabled for smartphone – all of that sits on a common platform that's familiar to the rest of the enterprise. So, whether this solution is exposed to everyone throughout the company or whether it is constrained to particular groups within the organisation, the customer can make those calls."

Jonathan Dutton agrees that the ability to constrain the development groups means that the customer remains firmly in control of security, saying: "Today's IT infrastructure is very secure but also quite closed, thus creating a small circle of decision makers. 3DSwYm leverages the information stored in silos and provides a basis for communication around this. So, critical data is still secure, it's the conversations around this that will become open, but only to the community that the project owners have selected."

Another objection, according to Shoemaker, derives from a general suspicion of social networking within companies. He says: "Getting these executives to understand that this is not Facebook, Twitter or MySpace or any other type of consumer social website where you're talking about personal activity, but are talking about a space where professional activity takes place, where productivity can be enhanced, where all sorts of processes can be accelerated."

Clearly these are still early days for the use of social media for product development. None of the software companies currently has any customer applications that they are able to discuss (although PTC says it is currently trialling it with some customers). Nonetheless, it seems clear that this will be the way in which products are likely to be designed for years to come. As Tom Shoemaker puts it: "You get to a tipping point and then there's no looking back. This is something that we've monitored and we've decided to commit to it because there are real challenges here and so we've invested in the solution. I would envision that, like most technology change, it will follow a development curve whereby the early adopters are already out there and everyone else will soon follow."

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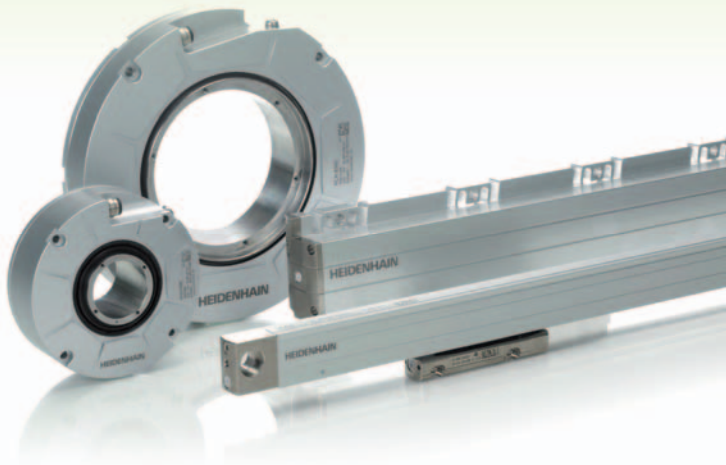

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Crossing the 'valley of death'

Getting technology out of universities and into the hands of those who can develop it isn't easy. Graham Pitcher talks to a man who is trying to make it easier.

The popular view of a university researcher is probably the 'mad professor', closeted in a laboratory, whose work is punctuated with small explosions and occasional cries of 'Eureka!'. While that may have once been the case, university researchers today are more in tune with the needs of industry.

Martyn Buxton-Hoare, assistant director of Research and Enterprise Support at the University of Surrey, says things have changed dramatically since the introduction, some 10 years ago, of the Higher Education Innovation Fund, or HEIF; a scheme designed to encourage knowledge transfer in universities. But he believes the approach was based on a mistaken view of the value of commercialisation in US universities. "Over time, it has become apparent that commercialisation, by itself, is useful, but is not a method of funding. What has also become apparent is the activity has other benefits; including gaining research contracts and improving a university's image."

Buxton-Hoare believes there is a misconception about the type of research work done in universities. "University research doesn't always result in something that can be used immediately. Taking it to the point where industry can begin to get an idea of what the benefits might be and quantifying them – even whether it fits their business – takes money. It's a 'valley of death'."

One way in which Buxton-Hoare's 'valley of death' is being bridged is by the recently introduced Knowledge Transfer Account (KTA), 12 of which have been set up by the EPSRC and Surrey is running one.

Surrey's KTA is getting £3.9million over three years. Says Buxton-Hoare"This has allowed us to move 30 projects forward which wouldn't have got funding from anywhere else," he notes. "By spending small amounts – up to £40,000 – we can determine whether the technology is special or not, and these are sums that SMEs can't afford."

Buxton-Hoare believes the KTA approach is one of the best things the EPRSC has set up. "It enables us to approach companies and ask for contributions in kind; it gets us through their doors. Their first reaction is often that we are after money; all we want is advice on what to do with a research project and how to keep it on the right track."

He gives as an example a Surrey academic's development of an analytical system thought to be of use in drug discovery. "We took it to a large pharmaceutical company and the reception we got was more open because we were not asking for money. But the advice we got was invaluable; without it, we would have gone down a useful, but not groundbreaking, track. It pushed the academic to address something that was a roadblock in their process."

While many companies are interested in new technologies, Buxton-Hoare says they won't be really interested unless the research addresses the bottlenecks they perceive. "Many academics know broadly what the problems are, but not the key problem. Research proves something can be done, but not what the limits of performance may be," he says. "KTAs help us to put those boundaries in place."

"By spending small amounts, we can determine whether the technology is special or not"

University research is not always commercialised in the short term, however. "It took 23 years for Surrey Satellite Technology to develop significant revenue," says Buxton-Hoare. "A significant event was a five year research agreement with EADS Astrium to spend £5m on space engineering research. That allowed us to build our capacity and expertise. From a strategic point of view, that was more important than cash, allowing us to build space engineering capacity in South East England. Lots of companies are now feeding in, that's attracting Government sponsorship and we are linking with Harwell to create something larger. Without that contract, the space centre would still be relatively unknown."

This new focus on working more closely with industry has changed what goes on at Surrey. "Academics are more upbeat about what's done with their technology and on seeing that it has an effect. From the university's perspective, our standing with the research councils is enhanced as a result of generating commercial success from the money they supply," he says.

www.beeas.co.uk

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Composite wheels boost impact resistance

A British company has developed composite wheels that offer a variety of benefits. Paul Fanning reports.

A UK company has developed a carbon/magnesium composite wheel for performance vehicles that is not only lighter than conventional wheels, but can also offer increases in speed, can take much greater impacts than conventional wheels and provides considerable potential for fuel savings into the bargain.

The wheels, which have been developed over a five-year period, are the creation of NRG Wheels, a UK company, whose research and development director Bevis Musk admits ruefully that, while the first wheel was produced from concept in just eight months, development overall has taken five years to get to this point.

Based in the UK, NRG Wheels specialises in designing, manufacture and marketing structural composites for the automotive industry. The carbon/magnesium car wheel was originally invented to create a better driving experience based on improved handling and better impact resistance as well as reduced fuel and engine emissions.

This has been achieved by focusing on the two main components of the wheel; the hub and the rim. The forged, magnesium alloy based hub of the wheel has been designed to reduce the normal cast magnesium porosity and corrosion potential of the wheel to zero.

The other major feature influencing the wheel's design and performance is the carbon composite wheel rim. NRG Wheels developed and produced the wheel rim with the support of Huntsman Advanced Materials who selected and provided an Araldite resin system especially adapted for Resin Transfer Moulding (RTM). The resin was also designed to achieve the highest level of targeted performance, defined by challenging criteria to deliver increased toughness and better impact resistance.

During the RTM process to produce the carbon rims, aerospace type carbon fabrics are put into a mould and injected with epoxy resin. Specially-coated titanium fasteners working within specially-bonded bushes fasten the hub to the epoxy carbon fibre rim, so no additional auxiliary component bonding or finishing is required. Thanks to the quality of both the resin and the processing conditions, the visible outer side of the rim has an aesthetically pleasing surface finish, showing the carbon fibre pattern. The surface is protected from UV light and other environmental elements with a tough, high-gloss lacquer paint finish.

Combining properties of toughness and high temperature resistance, the Araldite RTM system assists in creating a carbon wheel that offers better impact resistance than metal wheels and has high fatigue resistance.

The carbon/magnesium wheel is 40% lighter than even the lightest aluminium or magnesium wheels. Substituting conventional materials with composites creates a direct primary weight reduction, allowing the carbon rims on the wheel to have a noticeable effect on a car's fuel economy, reducing fuel consumption and emissions while enhancing performance and handling. When tested on a Porsche with a 380 bhp engine, the carbon/magnesium wheels helped to achieve power savings of around 43 bhp, equating to an approximate fuel saving of 10%.

Says Musk: "We tested them with Porsche and they were amazed by the increase in speed. "And, because the wheel is lighter at the rim, it

means that there is less fuel used in turning it. These wheel types reduce gyroscopic effects and the moment of inertia. This results in improved acceleration and braking with reduced stopping distances, better grip, lighter, sharper steering, improved wheel and tyre balancing, more stable tyre temperatures and pressures, as well as reduced fuel consumption and engine emissions.

"The high-toughness resin makes the carbon matrix work to its best possible extent," says Musk. "The special Araldite® RTM resin was ideal for this application in meeting the high strength to weight ratios required for improved impact resistance, allowing the carbon/magnesium wheel to take over two times the impact of metal wheels."

This impact resistance is probably the single most spectacular benefit offered by the composite wheels, in fact. Says Musk: "The wheel demonstrates resistance up to an impressive 1600 joules. In contrast to metal

wheels, cracks do not increase and the wheel reverts to its round shape while retaining great strength, rigidity and the flexibility required for both road and track. This makes the wheel safer in road impacts as the tyre retains its air and the car can be driven safely, even following a major impact."

In fact, video footage shows that the wheels pull back to shape from as much as six inches of deformation and, despite applying pressures "equivalent to dropping tonne weights on it", Musk says "I've never had a wheel break in a test yet".

This resilience, claims Musk, means that the wheels could be of use in military, as well as civilian applications. For military applications, not only could carbon composite wheels prove useful in improving overall vehicle performance, it could also prove beneficial in ballistic response settings. When compared to metal wheels, in extreme blasts less shrapnel penetrates the vehicle equipped with carbon composite wheels. Says Musk: "These wheels could be used on military vehicles as their impact resistance gives them a chance of driving away from an IED, while the shrapnel from the composite wheel is non-injurious when compared to other materials."

The overall potential for carbon composite wheels is large, but specific. The wheels are suited to higher-value and high-performance vehicles. The instant performance advantage and simplicity of fitment makes the NRG carbon wheels a natural choice for highly tuned vehicles, either OEM or aftermarket.

The reduced moment of inertia generated by using composites also makes the wheel suitable for use on delivery vehicles and buses, where stopping and starting is frequent.

RTM with suitable epoxy resin systems allow the production of reproducible high quality parts within acceptable cure times. The flexibility of this process also authorises new design ideas, such as the carbon wheel rim, which would not

be possible with metal constructions.

Musk concedes that, as things stand, the wheels are still "at the high end in terms of cost due to the cost of the raw materials", as he puts it. However, he anticipates further developments of the technology.

NRG Wheels and Huntsman recently won the Sports and Leisure category of the JEC Innovation Awards 2011 for the carbon/magnesium wheels, in recognition of the innovative use of composites in high performance vehicle applications.

www.nrgwheels.co.uk
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The NRG composite wheel can pull back to normal from as much as six inches of deformation

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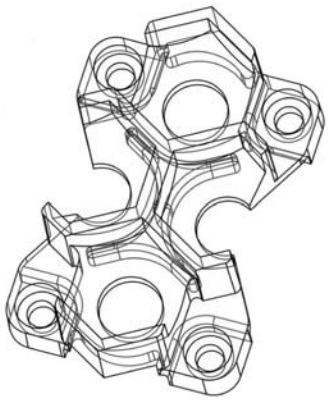

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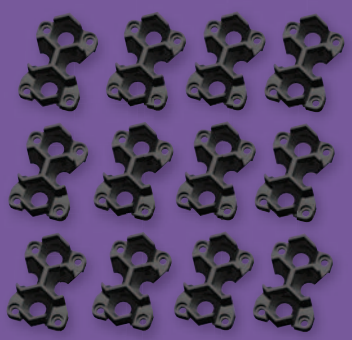

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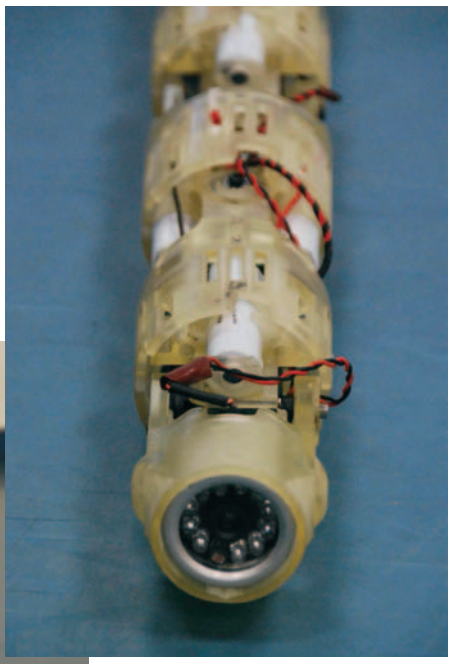
The material world of RP

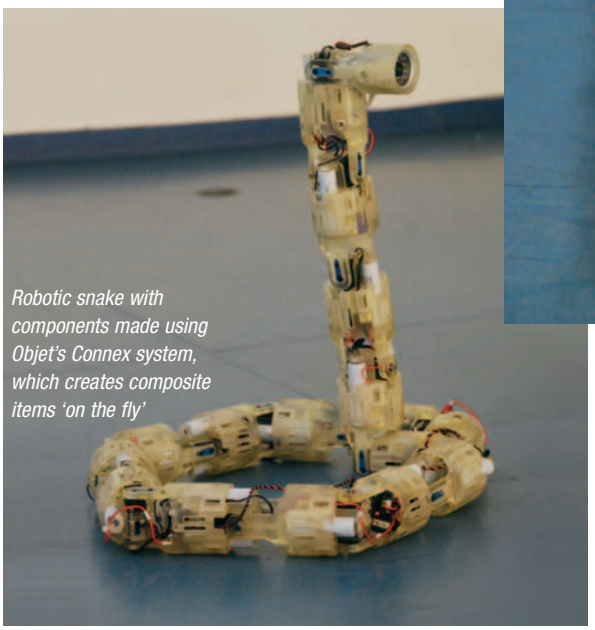
The proliferation of rapid prototyping and manufacturing methods relies on a range of materials to provide solutions for a number of engineering and manufacturing challenges. Matt Bailey reports.



As projects like the European aerospace and defence group's Airbike (see www.eurekamagazine.co.uk for details) demonstrate, it is the development of new materials in association with processes like additive layer manufacturing (ALM), fused deposition modelling (FDM) and 3D printing that are driving rapid prototyping and rapid manufacturing. The Airbike is made out of a Nylon polymer which is strong enough to replace steel or aluminium and requires no conventional maintenance or assembly. It is built as one piece; the wheels, bearings and axle being incorporated within the additive layering process and built at the same time.

In theory 3D printing can use any material that can be obtained as a powder. In practise a range of metals and plastic polymers are used both in powder and liquid form, the liquid being 'jetted' in layers to build up the part and then, generally UV-cured, or extruded in molten form. Powders an applied in thin layers and bonded, sintered or melted by lasers or electron beams. Through combinations of materials and processes a range of surface finishes and properties can be created.

Israel-based Objet Geometries' thin-layer, high-resolution three-dimensional printing systems use PolyJet polymer jetting technology to print in 16-micron layers. The company's Connex machines can jet multiple materials simultaneously and create composite items on the fly using its own FullCure materials to create accurate, clean, smooth, and highly detailed 3D parts.



Robotic snake with components made using Objet's Connex system, which creates composite items 'on the fly'

Objet's marketing manager Europe, Eric Bredin, explains, "Our machines are able to print multiple resins at the same time. For example, we could use a VeroWhite resin along with a softer Tango Black resin. We can digitally mix these resins on the fly so we can build parts with different properties, we could for example make a hand razor prototype with softer grippable areas. In the CAD system we can specify different Shore values on the prototype and our system will automatically interpret this data and jet the correct material mix in the right area to give the desired texture. For more sophisticated applications where you need fit and form and assembly checking, the combined materials capabilities of the Objet Connex machines are ideal."

Objet claims to be the only company currently offering this simultaneous multi-material printing capability. The technology can be scaled up or down and while it is currently only in Objet's Connex machines, the aim is to have multi-material jetting in a desktop machine in future.

"There is potential to use this in many vertical segments," says Bredin. "It has many different applications. A prototype sporting shoe with the sole made from soft material which can be tested for flexibility before you manufacture is a good example. Every new material opens up a new range of potential applications in what we call the 'third F' – the first F being 'fit' the second F being 'form' and the third being 'function'. Functional testing is linked through what you can achieve through material development and most of our research and development investment is in materials properties. The more we can develop new materials, the more applications we will be able to address."

Tim Heller, managing director of Stratasys says the importance of materials in the RP process cannot be overstated. "When we changed from wax to ABS on our early fused deposition modelling (FDM) machines in 1994, it changed the perception of our technology because the quality and functionality of the parts got better."

In the FDM process the machine dispenses two materials – one for the model and one for a disposable support structure - which are liquefied thermoplastics deposited by an extrusion head which follows a tool-path

ZCorp's 3D printing technique uses a four-colour CMYK powder printing and binding process

defined by the CAD file. The materials are deposited in layers as fine as 0.125 mm (0.005") thick, and the part is built from the bottom up.

"There are a lot of known thermoplastics that we can use today including ABS and polycarbonates in a lot of potential variants," says Heller. "Our most recent success was the introduction of Ultem which is well known in the aerospace industry due to its high-strength to low-weight ratio, flame-retardant and high-performance properties, and its FST (flame, smoke, and toxicity) rating."

Most approaches to additive manufacturing have to have a support mechanism. Stratasys' FDM process uses two sets of filament for the materials; one is for the model and the other for the support. Usually the support plastic is designed to snap off. "Some of our materials use this break away support system but after a few years using ABS we came up with the interesting idea of a plastic support material that would dissolve in water," explains Heller. "While this can't be used with high temperature plastics like Ultem or even polycarbonate, it is fine with ABS and can be washed off easily using a hot water cleaning solution. This allows you to produce highly complex internal structures because the support material will wash out in a solution.

"When we looked a bit more closely at this water-soluble material it started looking interesting in its own right because, due to its water soluble nature, you can use it as the primary model material to build soluble cores for composite lay-ups, so the secondary material has now, in a couple of cases, become the primary material," says Heller.

Tim Heller stresses that knowledge is a very important part of the picture with RP. "The mechanical properties of any new materials are crucial for design engineers to understand where and how they can be used," he says. "We have an interesting group of materials that we can do a range of different things with, but there are many more potential users of this technology who need a proper understanding of how the materials will perform."

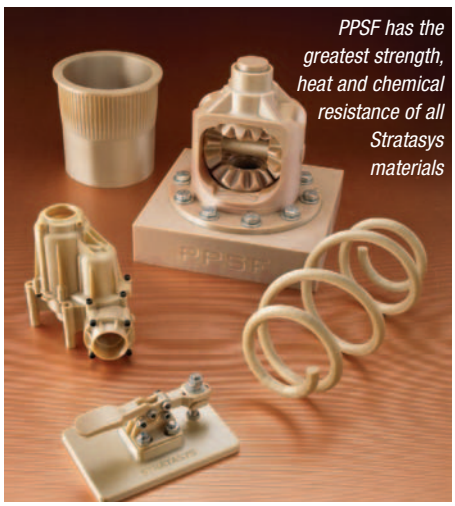
Colour also plays a major role in how we perceive and respond to objects. Massachusetts-based ZCorporation's 3D printing technique uses a four colour (plus clear) CMYK powder printing and binding process to build work pieces that can use up to 390,000 measurably different colours on the fly made out of its ZP150 material.

Initially the system was mainly used for labelling parts and adding logos, but as the knowledge of the system's capabilities spread users started to use it to add more lifelike colour. "You can now look at some parts and be hard pressed to tell that they are printed parts because they look so real," says ZCorp's VP of product management, Joe Titlow. "We now have users striving for that realism with colour and able to do some amazing things."

The footwear companies are once again at the forefront using the technology. "They are producing full mock-ups of their shoes in full colour in a way that is so detailed and realistic that you can put three shoes on a table and people will find it hard to point out the printed one," says Titlow. "You can get people to react to all the visual cues of that shoe without having to manufacture the finished product."

In future, Titlow predicts improved performance. "I see even better, more realistic colours, better surface finish and improved materials properties," he says. "If you can get the colour, the performance and the material properties right, I think there is tremendous potential."

www.objet.com
www.stratasys.com
www.zcorp.com



PPSF has the greatest strength, heat and chemical resistance of all Stratasys materials

Prototype Projects offering Accura PEAK Prototypes

Prototype Projects Ltd, the Royston-based rapid prototyping bureau, is now offering SLA® prototypes using a newly engineered material called Accura PEAK™ Plastic.

The material, originally launched in the USA in 2010 by 3D Systems, is designed for optimal performance, accuracy and stability during prolonged exposure to elevated temperature and humidity.

Ideal applications include the most demanding automotive, aerospace and motorsports applications requiring strength and stiffness and the highest levels of thermal and humidity stability.

Accura PEAK Plastic is a precision material for the production of high definition master patterns, fixtures and jigs, thermoforming tools and functional models requiring accuracy and dimensional stability

Justin Pringle, Prototype Projects Managing Director, said, "We believe we are the only UK-based prototyping bureau to be using this new breakthrough material. For the UK market, particularly with its rich engineering and design base, a material that can withstand temperatures of up to 125 degrees Celsius offers a real benefit for physical testing of prototype properties."

Pringle continues: "The Accura PEAK Plastic is specifically for use with the Viper SLA Systems we use in-house every day. This, combined with our experience and capabilities, means we can offer a unique – and unrivalled – prototyping service for designers and manufacturing businesses across the UK.

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Solving problems before they happen

Matt Bailey finds out why filtration and condition monitoring are crucial for a long life for hydraulic equipment.

Over 85% of all hydraulic system failures are a direct result of contamination. Contamination interferes with the four basic functions of hydraulic fluids: to act as an energy transmission medium; to lubricate internal moving parts; to act as a heat transfer medium; and to seal clearances between moving parts. If any one of these functions is impaired, the hydraulic system will not perform as designed. The resulting downtime can easily cost thousands of pounds per hour.

Hydraulic fluid maintenance helps prevent or reduce unplanned downtime. Properly sized, installed, and maintained hydraulic filtration plays a key role in machine preventative maintenance planning. It is important to remember that while the function of a filter may be to clean oil, its purpose is to reduce operating costs.

Detecting the level of system cleanliness allows users to prevent impending failure. Matt Fielder, industrial business development manager of Parker Hannifin's Hydraulic Filter Division Europe explains the importance of good filtration and condition monitoring. "Filtration is security," he states. "If you don't put filtration on your systems they won't last as long. Filters are there to add a level of security and system life extension. In my experience, people think a filter is a filter, but there is a lot more to it than that."

Keeping hydraulic fluid clean needs filters, but to do it properly you need condition monitoring. "We are the leading manufacturer of field-use portable particle counters for hydraulic fluid condition monitoring," says Fielder. "They are light-obscuration devices which measure particles in fluid down to 4 micron(c). Ongoing condition monitoring ensures that any maintenance programme is enhanced by providing preventative maintenance rather than reactive maintenance."

In the wind energy business, where turbines often have to operate in extreme conditions, performance is all important. As turbines have become more efficient, their performance tolerances have increased, making them more complex with more precise controls and higher pressures in the servo and solenoid control valves. As the systems get more complex they have far less tolerance of dirt, so the efficiency of filtration has to improve. "Fifteen years ago a particle removal beta ratio of 75 was the norm, but this is now increased to as much as 1,000," says Fielder. "We are looking to take out more and more of the smaller particles with a much more efficient filter with a longer life dirt-holding capacity. System cleanliness and integrity is of paramount importance, especially when turbines are offshore. The cost of replacing a faulty hydraulic system on an offshore turbine could be ten times that of an onshore one. Accurate real-time condition monitoring will allow you to see a failure days and sometimes weeks prior to it happening."

Higher hydraulic pressures, ie 400-600 bar, mean the systems can become more compact; the trade-off is in much tighter tolerances and more fragile of systems. Filtration and condition monitoring play a crucial role in keeping systems running in extreme conditions like those found offshore or in mines.

According to Fielder, Parker is now heading towards permanently fixed online particle counting. "This means having a real time monitoring system checking the condition of the oil from second-to-second and reporting it through telemetry. At the moment we look at the water content along with the amount of solids, but we're looking to develop viscosity, density, dielectric and other oil property analysis tools which will give you a really accurate oil life monitoring system," he says.

www.parker.com

O-ring systems seal the deal

Customer and testing data has proven that Simrit's E454 EPDM (ethylene-propylene rubber) O-ring sealing systems outperform competitive O-rings in critical commercial aircraft hydraulic systems. Manufactured to the highest possible quality and extensively tested, the phosphate ester fluid hydraulic sealing systems are expected to perform flawlessly for years in primary and secondary flight controls, and braking systems of commercial aircrafts.

"Based on our test results and simulated component tests, we knew that the E454 material was a quantum leap over competitive materials when we commercialized it in 2006," said Dr. Robert W. Keller, materials development manager, Simrit. "Today, our E454 compound not only meets the demanding requirements of NAS-1613 Rev. 5 in all commercially available phosphate ester hydraulic fluids, but it significantly outperforms competitive materials in both simulated and actual application systems."

The hydraulically boosted primary and secondary flight controls are critical to modern commercial aviation, as they provide the basic abilities of the aircraft to fly, turn, climb, descend and stop. As a result, all aspects of the systems – including the sealing technologies – are vital to passenger safety.

"To ensure the consistency and quality of the product, we only manufacture the E454 compound at our Santa Ana, California AS9100 and Nadcap-certified facility," said Vinay Nilkanth, vice president of global sales, aerospace, Simrit. "This allows us to manufacture the highest-quality products for our customers' crucial needs."

As a result of its superior composition and performance, several major commercial aircraft manufacturers and suppliers have chosen the material over its competitors. As an example, Simrit's E454 O-rings were chosen exclusively by a major manufacturer of flight control hydraulic power units and were evaluated with the latest Type V (AS1241) phosphate ester hydraulic fluids in a wide body commercial aircraft. After several thousand hours of service and several hundred complete flight cycles, the Simrit E454 O-rings were examined and found to be in "as new" condition in terms of dimensions and physical properties. Competitive O-rings had shown issues with wear and compression set under similar circumstances.

www.simrit.com

Element range extended

Burkert's Element system of high-performance stainless steel process measurement and control products provides a complete systems approach, linking clean line valves, sensors, positioners and valve actuators in a simple architecture to provide total control loop processing for clean and washdown working environments.

The extended Element range, which is being added to continually provide a modular programme of process control products that combine to deliver solutions for specific process requirements, whether they be in environmentally aggressive or hygienic areas. The products include valves for on/off and modulating control, and sensors for pH/ORP, conductivity and level; plus digital positioners, control heads and actuators, all of which are designed for valve mounting, delivering maximum space saving and performance.

In addition, the integration of backlit displays and coloured status lights on many Element products, enables users to have more interaction and transparency in their systems, by being able to quickly determine diagnostic messages at a glance.

Autonomous, with on-board intelligence options and highly flexible integration options, Element makes possible distributed control solutions that would otherwise require large control cabinets; and it does so with considerably less investment in planning, assembly and maintenance, as well as wiring and pneumatic hose connections.
www.burkert.co.uk

Rexroth develops undersea hydraulic components

Rexroth has adapted a number of standard components to fit the special requirements for deep-sea applications. These include pressure compensation and corrosion protection.

In order to test its design, Rexroth developed a Subsea test power unit equipped with a water-proof motor/pump assembly. This drives an axial piston motor and hydraulic cylinder via an encapsulated valve control. The hydraulic system comes in a pressure-compensated design. Rexroth tested the equipment in a unique pressure chamber facility and successfully demonstrated the suitability of its hydraulic components to a depth of 6,000m below sea level.

Lee Hinchcliffe, sales manager for Marine & Offshore at Bosch Rexroth, said: "We have successfully fitted Rexroth adapted components on machines such as the Subsea Crawler from Aker Wirth. We are the first to achieve such a high performance under harsh testing conditions, making Rexroth components vital for deep sea applications."
www.boschrexroth.co.uk.

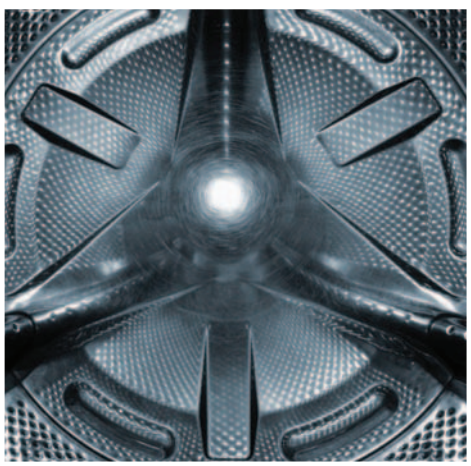
Better bearings drive improved efficiency

Bearing optimisation could lead to a huge reduction in energy usage and emissions. Matt Bailey looks at some of the latest developments.

In the quest for energy efficiency, friction is the enemy. Bearings provide an obvious solution for overcoming the forces of friction and they can be found at the heart of pretty much any apparatus with moving parts. Although the standard practise of replacing worn or damaged bearings in existing equipment is still vital, the development of new, more efficient and thus energy-saving bearings has become a priority.

NSK's constant bearing improvement programme was designed to help equipment manufacturers meet energy targets. The programme, a synergy of materials, design, lubrication and sealing technology, has achieved a 30% improvement in efficiency for the company's standard deep groove ball bearings, and an even larger 47% saving for domestic appliance bearings: both compared to conventional ball bearings of the same size. These savings are helping to reduce energy use in high consumption equipment like electric motors, air conditioners and domestic appliances.

"Bearings are components that make a big contribution towards energy efficiency," states Kevin Delehanty, senior applications engineer at NSK. "We, as a bearings company, have an opportunity to drive up efficiency levels, reduce torque and reduce friction. This is the main driver of our improvement programme.



"There are a few different things we can address to achieve greater efficiency," says Delehanty. "There's the relative motion of the ball bearing on the raceway, which generates friction; there's the lubrication, grease, oil which has an effect on the torque and the efficiency; then there's the materials, the steel of the bearings and the cage. Optimising these three areas will increase efficiency. There are benefits for the consumer in terms of less energy used and lower energy bills, but also the appliances will have longer lifetimes. Downtime is reduced, meantime between failures is increased and you can lengthen maintenance intervals."

But there are certain limits to design. The basic ball bearing hasn't changed in a hundred years, although small tweaks to the surface finish of the raceway have been achieved and improved accuracy has resulted from better machining practices. Improvements in the materials have also had an impact. Steel cleanliness has improved enormously over the last 20-30 years.

NSK has improved the steel-making process and operating conditions to reduce impurities substantially, thereby achieving a decrease in oxides. The resulting long-life Z Steel is now the standard material for the company's bearings. Bearings manufactured from Z Steel have a significantly extended service life when compared to conventional vacuum degassed steel: up to 1.8 times longer. In addition, Z Steel also benefits from more uniform response to heat treatment, a process that ensures good hardness and excellent wear resistance.

And then there is the important question of lubrication. "Grease formulation and development is an on-going process," says Delehanty. "New, better greases come on the market all the time. We develop our own, so improvement is step-by step but we don't really anticipate and great leaps forward."

When it comes to producing better bearings for domestic goods, however, there are certain limitations in terms of design. "High capacity bearings for white goods have to fit into the same envelope as the existing bearings but have a higher capacity," says Delehanty. "We can put larger and more balls into the bearing giving longer lifetime and higher reliability. You can also downsize the equipment. If you're using, say, a standard 20mm bore inside diameter ball bearing at the moment, in the same application you could potentially put 15mm high-capacity bearings with the same load rating and the same lifetime, but you've reduced the size, so you can design your equipment to be more compact which is what everybody wants to do."

SKF is another organisation exploring energy-saving bearing technology. "Energy efficiency continues to sit at the top of the political agenda, with the introduction of ever tougher environmental and climate change legislation forcing all companies to cut their consumption of primary energy by 20% by 2020," says the company's Phil Burge. "Manufacturers need to take action, both to control costs and comply with legislation. The efficiency of electric motors is attracting more attention as this technology is responsible for consuming more than two thirds of all electricity in general industry, thus representing a large cost saving potential."

One solution is to replace the bearing units in

existing motors with modern energy efficient equivalents. "This can be done both during initial manufacture and subsequent overhaul;" says Burge, "in each case, energy consumption can be cut by up to 50%. This technology makes it possible to reduce frictional losses by at least 30%, even when compared with the most efficient traditional bearings, and by as much as 50% or more, when the comparison is with older product designs."

Energy efficient bearings also run more smoothly and at lower temperatures than standard bearings at equivalent loads and speeds, generating less heat, and extending grease life and re-lubrication intervals to allow maintenance costs to be reduced further still. Also, bearing service life is extended significantly, with it being more than doubled in some cases, which in turn, can have a considerable positive impact on the operating life of the average motor.

SKF's energy efficient bearings feature optimised internal geometry and tough, lightweight polyamide ball cages, which are less susceptible to deformation, as well as featuring low friction lubricating greases, with each bearing being sealed for life to minimise the need for maintenance.

Prevention is of course better than cure and there are a range of methods for detecting faulty bearings. According to Dave Manning-Ohren, condition monitoring manager at Eriks, worn bearings often emit sound at frequencies between 20 and 100kHz, which is outside normal human hearing. "Detection, via fixed or hand-held meters which convert signals to the audible range and present them on a graphical display, can be a valuable method of isolating a faulty or worn system. Although interpretation requires a degree of experience, the results can be remarkably accurate," he says.

"In a few instances, vibration is a specified machine function. In most cases, however, it is an indicator of inefficiency, leading to heat, noise and energy losses. Most vibration occurs within rotating systems, often where it is hard to detect and where it only becomes obvious when components – typically bearings – fail," continues Manning-Ohren. "Measuring vibration can be achieved using small fixed accelerometers, permanently connected to plant-wide monitoring systems, or plugged into portable meters. Alternatively, hand held probes can be used where equipment is accessible. In each case, data is normally collected over time, so that deterioration in operating conditions can be identified and resolved before problems occur."

Reducing energy consumption is now a top priority for many companies to counter the effects of growing energy bills and increasing environmental responsibility. Thanks to developments in bearing technology and the introduction of energy efficient solutions, plant managers are now able to realise dramatic energy savings and increased productivity and reliability, leading to enhanced business performance at a time when it matters most.

www.nsk.com
www.skf.co.uk
www.eriks.co.uk

SKF fryer bearings increase reliability

SKF has launched fryer bearings specifically designed for use on automatic frying equipment and capable of withstanding the demanding oil-filled environment and high temperatures of fried food processing. The SKF fryer bearing units offer extended bearing service life, are corrosion-resistant and maintenance free, while benefitting manufacturers in food processing sectors where reliability and risk of contamination are key obstacles in ensuring optimum productivity and keeping production costs to a minimum.

SKF fryer bearing units incorporate the latest SKF bearing technology, and have been designed to overcome this testing environment. The units feature a special high temperature plastic material cage design, plus stainless steel shield and flinger in a corrosion-resistant housing. Unlike conventional bearings, the SKF bearings require no lubrication, thereby eliminating any possibility of oil contamination through grease washout and avoiding costly delays in food production. The units are highly resistant to abrasion and configured to allow cooking oil to enter the bearing and act as an effective lubricant, while at the same time preventing foreign matter entering the bearing.

The robust design and manufacture of the SKF fryer bearing units will eliminate the need for unplanned downtime or maintenance for re-greasing, which are typically associated with conventional bearings. This allows food processing manufacturers to extend the service life of bearings to more than 16,000 hours.

www.skf.com

Heason extends positioning stage range

Heason Technology offers a wide range of extremely precise air bearing positioning stages including the MAB-100 single axis linear motor driven stage. With a 100 mm travel range, nominal overall accuracy within one micron and a choice of resolution options, the MAB-100 essentially eliminates the unwanted motion characteristics that are associated with contacting bearing systems such as friction and hysteresis, and delivers exceptionally precise positioning with outstanding straight-line motion, high stage stiffness and rapid dynamic performance.

Aimed at nanometre level positioning applications in life sciences, data storage, semiconductor, and other market segments where uncompromised motion performance is essential, the MAB-100's non-contact brushless servomotor features a unique moving magnet design that together with the fixed linear encoder read head, eliminates the need for wear-prone moving motor cables. The non-contacting motor, encoder and bearing set allow clean room operation and ensure an extremely long working life.

www.heason.com

New angular contact rolling bearings

The Schaeffler Group has launched two new ranges of angular contact rolling bearing.

AXS and SGL bearings provide extremely lightweight bearing solutions that can support significant loads and high tilting moments. The reduced design envelope of the bearings also opens up new opportunities for more compact machine builds.

AXS and SGL angular contact rolling bearings offer designers a more cost-effective alternative to conventional ball and rolling bearings. The new bearings are cylindrical rolling bearings with raceways oblique to the bearing axis.

Similar to thin disc springs, AXS bearings have a conical bearing ring, produced by forming technology. A roller and cage assembly runs between these two hardened rings. Bearing diameters are currently available from 8-175mm.

The high precision of the SGL bearings is achieved by the machined, ground bearing rings, which have a triangular profile. A roller and cage assembly runs between these two hardened rings. The cylindrical rollers are guided by a cage, which is made from a wear-resistant polymer.

www.schaeffler.co.uk

Actuators boost competitiveness

The new Exlar K Series of linear actuators from INMOCO is designed to improve OEM competitiveness, with a range that offers multiple model types, enabling users to chose the option best suited to their application and budgetary requirements. Providing a truly universal solution for rod style actuator applications, the K Series actuators use Exlar's patented roller screw technology, with its proven reliability and superior load carrying capacity, and allow the user the choice of multiple - and lower cost - motor technologies.

The price/performance ratio of the K Series electromechanical actuators means that they provide a clean, fast, simple and cost- effective replacement for hydraulic actuation, delivering a solution that offers superior life and performance. In addition, with dimensions consistent to those for ISO Metric pneumatic actuators, the K Series units also provide a simpler, longer- life alternative to pneumatic cylinders.

The K series is available with the option of multiple grades of planetary roller screws and with an option for an ACME screw for applications where backlash cannot be tolerated. The patented roller screw mechanism enables Exlar to provide some of the most reliable, long-lasting electro-mechanical actuators on the market. The design of the roller screws allows them to be accelerated and rotated faster than comparably sized ball screws, while their large contact area allows high force characteristics.

www.inmoco.co.uk

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Tolerancing software cuts rework levels

Paul Fanning reports on software that could put the manufacturing engineer's experience on the design engineer's desk.

Software that can eliminate tolerancing faults at the design stage could save companies huge amounts of money in terms of scrap and rework at the manufacturing stage.

Tolcap is the brainchild of Martin Raines and Ken Swift of Capra Technology and is now available as a web-based software application thanks to a collaboration with web developer clever4. Dr Raines outlines the scale of the problem it is designed to address, saying: "One of the main causes of faults at the manufacturing stage is the wrong application of tolerances. The problem is that manufacturing departments want wide tolerances, while designers want tight tolerances – often with no regard for whether it can be manufactured. Designers design and then throw it 'over the wall' to manufacturing. The problem is that, when it comes to manufacturing, it can't be made consistently. And the later you have to make a change, the more costly it is."

Given that 30-50% of scrap and rework is caused by poor tolerancing, the seriousness of the problem is clear. Tolcap, claims Dr Raines, "puts the manufacturing engineer's expertise on the designer's desk", allowing them to arrive at a realistic and manufacturable tolerance.

Tolcap provides capability maps for more than 80 different manufacturing processes that allow the user to pinpoint the most efficient production method by examining alternatives for cost and capability. The software asks the user for a dimension and tolerance and returns a predicted process capability. The maps assume good practice in manufacturing operations, modern, well-maintained machinery and a design with no specific limitations set by material or geometry.

Three Application 'Wizards' then take the user through modifications to the prediction. The Mp Wizard allows the user to input information relating to the materials, while the Gp Wizard allows users to input variables relating to geometry. The Vp Wizard, on the other hand, takes into account additional variables such as machine age and the particular implementation of the process

Of course, if a customer is using a material or process that is not covered by Tolcap's process maps, the company can work with them to collect data on a specific process that can either be added to the software or held as intellectual property of the customer and only used by that customer as part of Tolcap's bespoke software.

Early adopters of Tolcap included Rolls-Royce and Dyson. And it is partly through big-name manufacturers such as this that Capra Technology hopes that Tolcap will be popularised as it is rolled out to their suppliers.

In companies such as these, of course, the great difficulty lies in making sure that, once adopted, the software is actually used properly. Says Raines: "The designer should be using this as soon as they are putting the dimensions in. That is the challenge for us: to get it seamlessly within the design process. We tend to rely on 'champions' within individual companies to convince their colleagues…This is a unique product – there's nothing like it anywhere in the world. And, while engineers can tend to be conservative, this product can save them a huge amount of time and money."

Tolcap is available at a subscription rate of £245 per month, which allows two users to use it at any time. Additional licences can be bought at £95 per month.

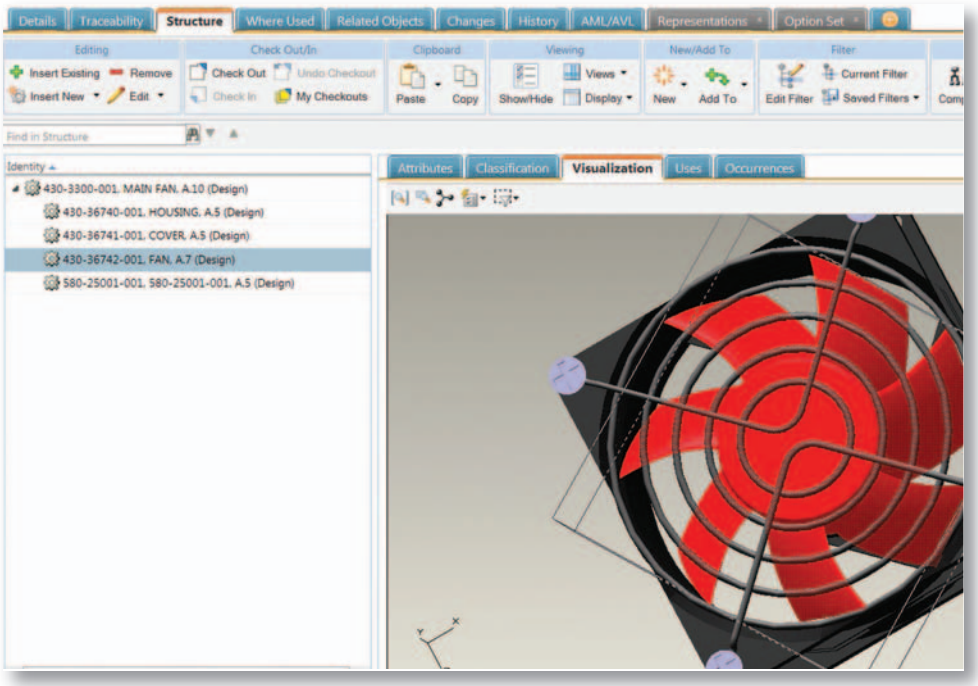
www.tolcap.com
www.capratechnology.co.uk
www.clever4.net

Windchill moves to the next level

PTC's Windchill 10.0 is designed to let users get more from their PLM system. Paul Fanning looks at some of its features.

Described by the company as "the largest software release in PTC's history", the recent launch of Windchill 10.0, the newest version of PTC's product lifecycle management (PLM) software is designed to offer users a range of new benefits.

One of the key messages accompanying this release is that it is designed to "enable manufacturers to do more throughout the product lifecycle, know more about product performance and get more value from PLM". This is being achieved with the introduction of capabilities that focus on product analytics and quality management, Windchill 10.0 allows customers to more effectively define, manage, and validate complete bills of material (BOMs), providing linkages across domain-specific views of product structures throughout the entire lifecycle. Windchill 10.0 also includes a new user experience and improved system administration, making it easier than ever to use and maintain and enabling broad adoption.



The user interface of version 10.0 has been radically improved and, in fact, can be tailored to individual needs. According to Martin Greenhalgh, principal technical sales specialist at PTC, this has in part been a case of simplifying the existing UI, which, he says "simply had too much information on the page".

This simplification has in large part been achieved by the introduction of PLM Navigator, which is much more like a standard browser in that it offers a search window and remembers browsing history, allowing the user to trace their steps back to a certain part's requirements or a supplier's compliance history with a few clicks. It is also possible to save search results, narrow them down with additional filters, or even export them as Excel spreadsheets.

Another innovation is the 'Breadcrumbs' feature, that orients users as to where they are in the application and allows them to quickly get back to where they came from. Also to declutter the UI, the page footer was removed and all the header links have been consolidated under the "Quick Links" menu.

Windchill centrally manages all product deliverables including MCAD, ECAD, documentation and service information. Windchill 10.0 unifies its ECAD data management capabilities to offer a common user experience, consistent with its existing approach for MCAD data management. This, claims Iain Lewis, PTC's principal applications specialist, will "enable Windchill to be the 'single source of truth' for all users".

With Windchill 10.0, PTC's Relex and Insight product lines have been rebranded as part of the Windchill product family to better reflect their availability as both a stand-alone offering as well as part of a comprehensive Windchill solution.

Windchill Quality Solutions (including the former Relex products) help improve next-generation products and reduce the cost of poor quality by preventing repeat errors and building reliability and risk management into the product development lifecycle. New offerings include solutions for CAPA (Corrective Action Preventive Action) to accelerate problem resolution through improved monitoring and root cause identification.

Bill of Materials (BOM) and cost analysis are also areas that have been simplified within the new product. Auto-suggest capabilities in Windchill 10.0 streamline BOM creation and editing tasks, while a new module, Windchill Cost, allows users to track the latest estimated costs throughout the lifecycle and even display cost overruns and budget issues within the assembly model itself.

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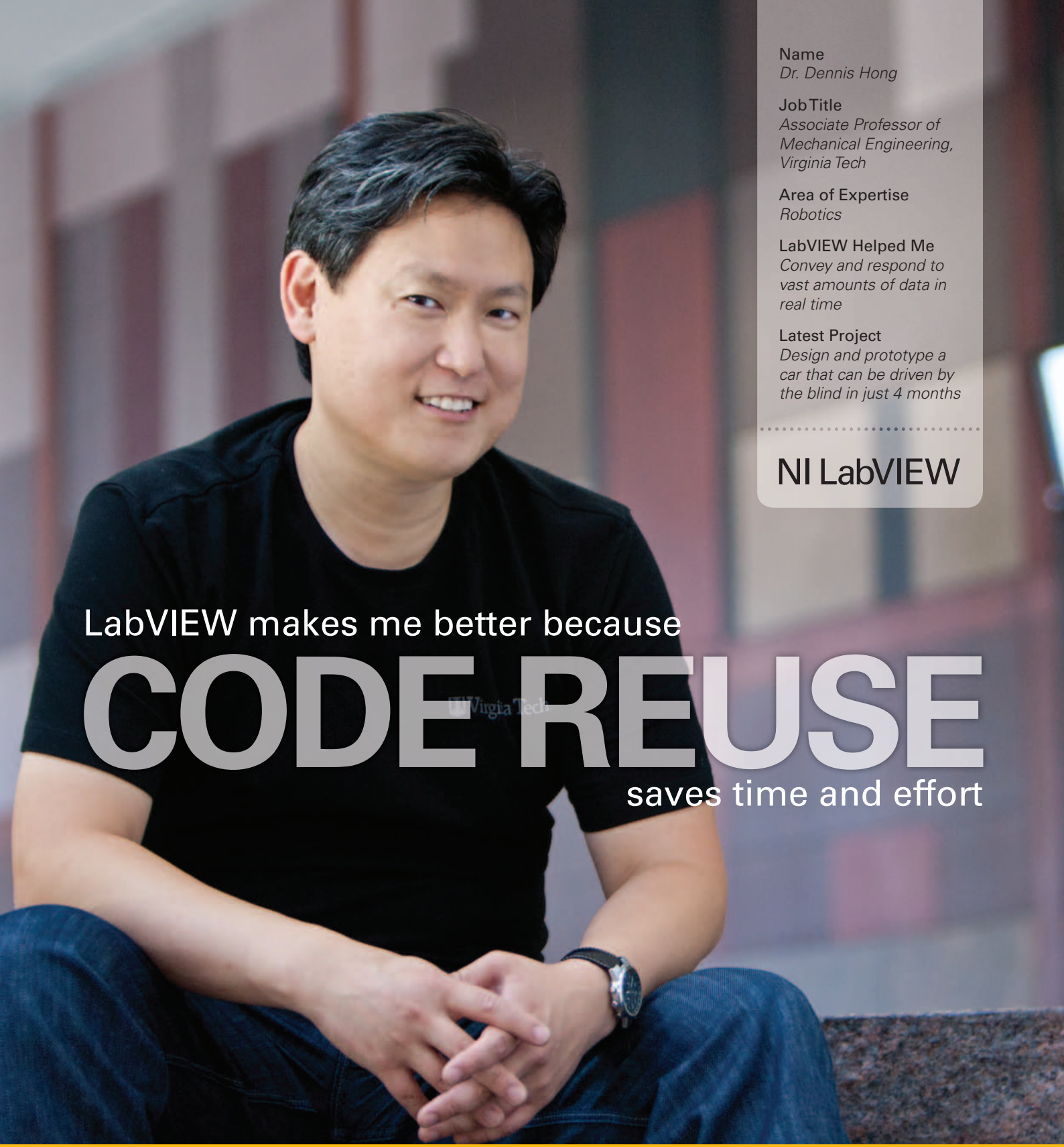

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Control in the spotlight

With the Sensors + Systems Show opening in September, Eureka takes a look at what's to come.

The Sensors and Systems Show taking place on the 14th and 15th September 2011 at the FIVE Building in Farnborough embraces all aspects of control & instrumentation, test & measurement, calibration, data acquisition, automation and analysis, plus many other industry specific disciplines and has come about as a direct result of close consultation with industry professionals.

Offering a time-efficient opportunity to review existing technology or source brand new products and services, the show also has a floorplan that means displays can be angled for maximum visibility and yet encourage market place informality.

In addition to the exhibition itself, the Sensors + Systems Show also offers a comprehensive and varied programme of free 1-hour workshops and seminars, all designed to be relevant to today's industry issues.

Some 17 different companies are presenting the workshops covering subjects as varied as 'Laser scanners for automated inspection and process control' through to 'An introduction to product testing for reliability'. Some of the companies and organisations participating include such well known names as Micro-Epsilon, Honeywell, Colibrys, Igus, Adsyst, HBM, Burkert, NPL, Techni Measure, Sensors KTN, Profibus, University of Sussex, Compostella and PARC.

The hour-long workshops and seminars are free to attend and allow engineers to choose their subjects of interest and learn the latest sensing and control techniques in use in industry, with the option of questioning the experts face to face. After the workshop, engineers can then visit the company's stand to view the exact products and ask further questions.

Workshop places can be reserved online together with free registration for a FREE visitor e-ticket to the show by visiting www.sensorandsystems.co.uk. Early booking is advised, as space will be limited.

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Workshop Programme

Wednesday 14th September
Workshop Theatre 1

11am - Session 1
Micro-Epsilon
2D laser scanner with integrated Ethernet for automated inspection and process control
Speaker: Glenn Wedgbrow, UK Sales Manager

Midday - Session 2
Honeywell Control Systems Ltd
Becoming Wireless
Speaker: Tony Alexander, Solutions Support Specialist

1pm - Session 3
Colibrys (Switzerland) Ltd
MEMS Accelerometers for industry and instrumentation
Speaker: Bahram Arbab, Sales Director Europe & Asia, Colibrys (Switzerland) Ltd

2pm - Session 4
Igus (UK) Ltd
Cables - The Weakest Link?
Speaker: Justin Leonard, Director

3pm - Session 5
Adsyst (Automation) Ltd
Intelligent Networks
Speaker: Martin Liniker – Managing Director

Wednesday 14th September
Workshop Theatre 2

11am - Session 6
HBM
Piezoelectric transducers- strain gauge based transducers - a comparison
Speaker: Thomas Kleckers, Engineer at

HBM Darmstadt Germany. Product manager for force transducer.

Midday - Session 7

National Instruments

How to Harness Cloud Computing for Data Acquisition

Speaker: Graham Green, National Instruments' Technical Marketing Engineer

1pm - Session 8

Techni Measure

Strain Gauge Applications in Industry with Wireless Communication and Energy Harvesting

Speaker: Ian Ramage

2pm - Session 9

Sensors KTN

The Electronics, Sensors, Photonics Knowledge Transfer Network (ESP KTN)

Speaker: Dr Robert Angus, Technology Translator

Introduction to Resonant Inductive Position Sensing

Speaker: David Ely, Director of CambridgeIC

Intelligent Sensing Using Multi-Functional Coatings

Speaker: Dr J.P. Feist, Managing Director, Southside Thermal Sciences (STS)

3pm - Session 10

Profibus Group

5 Essential Factors to Consider when Implementing Profibus/Profinet

Speaker: Paul Chapple, Technical Manager, Murrelektronik Ltd

Profibus Group

Automated communications and device monitoring on PROFIBUS networks

Speaker: Andy Verwer, Verwer Training & Consultancy Ltd

Thursday 15th September
Workshop Theatre 1

11am - Session 11

Micro-Epsilon

2D laser scanner with integrated Ethernet for automated inspection and process control

Speaker: Glenn Wedgbrow, UK Sales Manager

Honeywell Control Systems Ltd

Becoming Wireless

Speaker: Tony Alexander, Solutions Support Specialist

1pm - Session 13

Colibrys (Switzerland) Ltd

MEMS Accelerometers for industry and instrumentation

Speaker: Bahram Arbab, Sales Director Europe & Asia, Colibrys (Switzerland) Ltd

2pm - Session 14
Burkert Fluid Controls
Flow sensors for gases - Possibilities of design and system integration
Speaker: Jan Schlander Dr. Ing; Global Segment Manager for Gas Handling. Bürkert Fluid Control Systems

3pm - Session 15
NPL
The Measurement Network - building a community of measurement users
Speaker: Francis Tuffy - Measurement Network Manager

The Measurement Network is the place for people interested in measurement
Speaker: Peter Benson - Measurement Network Community Administrator

Thursday 15th September
Workshop Theatre 2

11am - Session 16
HBM
Safe fuselage assembly for modern commercial aircraft
Speaker: Dirk Moeller, Head of product management of industrial measurement solutions HBM Darmstadt, Germany

Midday - Session 17
National Instruments
How to Harness Cloud Computing for Data Acquisition

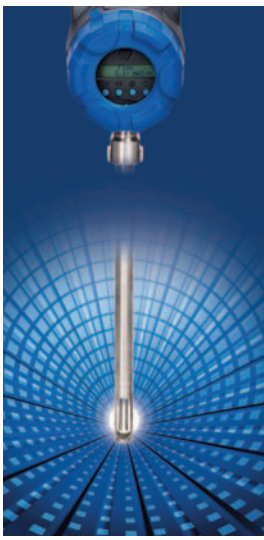
1pm - Session 18
Techni Measure
Design, Selection and Applications for Piezoelectric Accelerometers and other Sensors
Speaker: Steve Whitaker

2pm - Session 19
Sensors KTN
The Electronics, Sensors, Photonics Knowledge Transfer Network (ESP KTN)
Speaker: Dr Robert Angus, Technology Translator

The Electric Potential Sensor - Technology and Applications
Speaker: Prof. Robert Prance, School of Engineering and Design, University of Sussex

A 6-Degree of Freedom Interferometer
Speaker: John Weaver, Compostella

3pm - Session 20
PARC
PARC – An Introduction to Product Testing for Reliability
Speakers: Alison Macdonald - Sales Co-ordinator and Richard Tabor - Sales Manager



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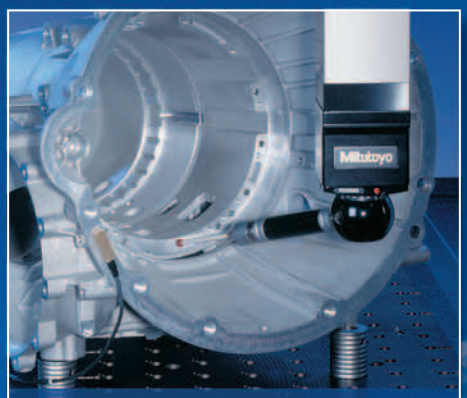
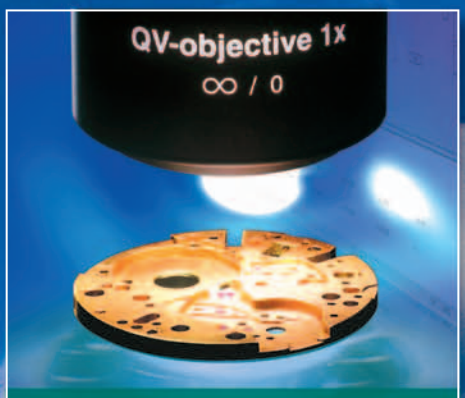


Coordinate Measuring Machines



Vision Measuring Machines

Form Measurement

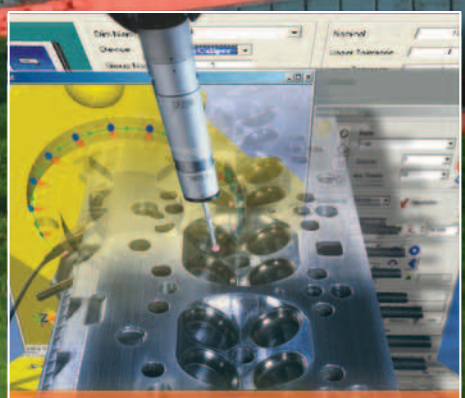
Optical Measurement

Sensor Systems

Test Equipment and Hardness Testers

Digital Scale and DRO

Small Tool Instruments



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Mitutoyo

READER INTERVIEW

DAVE WILLIAMS
SALES MANAGER
3M TOUCH SYSTEMS UK

Q How did you get into the engineering industry?

A I got into engineering straight from college really. I had just finished doing mechanical and production engineering at Oxford Polytechnic (now Oxford Brookes University) and I went straight into mechanical production engineering in the defence aerospace industry making seals and bellows devices.

Q What does your role involve on a day-to-day basis?

A I am responsible for sales across Europe for 3M Touch Systems. We are a division of 3M, selling interactive touch displays and interactive touch screen components to a myriad of different markets across Europe.

Our products mainly cover the 10 inch up to 42 inch range.

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

A We've just launched a slightly different technology. Most of our products for the last 10 or 15 years have been single touch input units, but we recently launched a projected capacitive touch (PCT) screen which enabled us to develop a digitiser solution and allows multi-touch operation. It means we can start playing in a whole different group of markets and what most of my team has been working on is finding new markets and new applications for what for us is a relatively new technology.

Q What is the most interesting project or piece of engineering that you have been involved in?

A I was involved in the development of an in-store, interactive ATM for a large banking ATM manufacturer, where they have been trying to move away from an 'in-wall' solution to give the customer a more interactive feel and genuine two-way interaction.

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

A Very much so. Over the last 15 to 16 years touch screen has gone from being a very niche premium product where customers were excited about the technology to a very commoditised solution where most people may have a couple of touch screen devices in their pocket.

Q What are the big issues facing your industry?

A Because it is becoming a commoditised market the biggest issue has to be competition. Larger manufacturers are driving cost down and we're starting to find that we're up against HP, Samsung and LG where previously it wasn't a market that was of interest to them. We have to develop our own value proposition now in terms of service and support and local expertise to ensure that we can win in the 'relatively' niche markets that we operate in.

Q How do you see the future of the industry?

A We see the market progressing differently in different regions, with many areas struggling more than the UK economically. That said, the amount of activity and the number of new projects are ever increasing and we're excited about having a PCT solution.

Q What still excites you about engineering?

A It's the continuing change that excites me; and it's clear that the rate of technological change - as magazines like *Eureka* demonstrate – is showing no signs of slowing down. Quite the reverse in fact it's almost certainly increasing at a very fast rate with new technologies hitting the streets every day. That's why most engineers still remain loyal to their trade; it's the excitement of not quite knowing what you'll find on your desk.

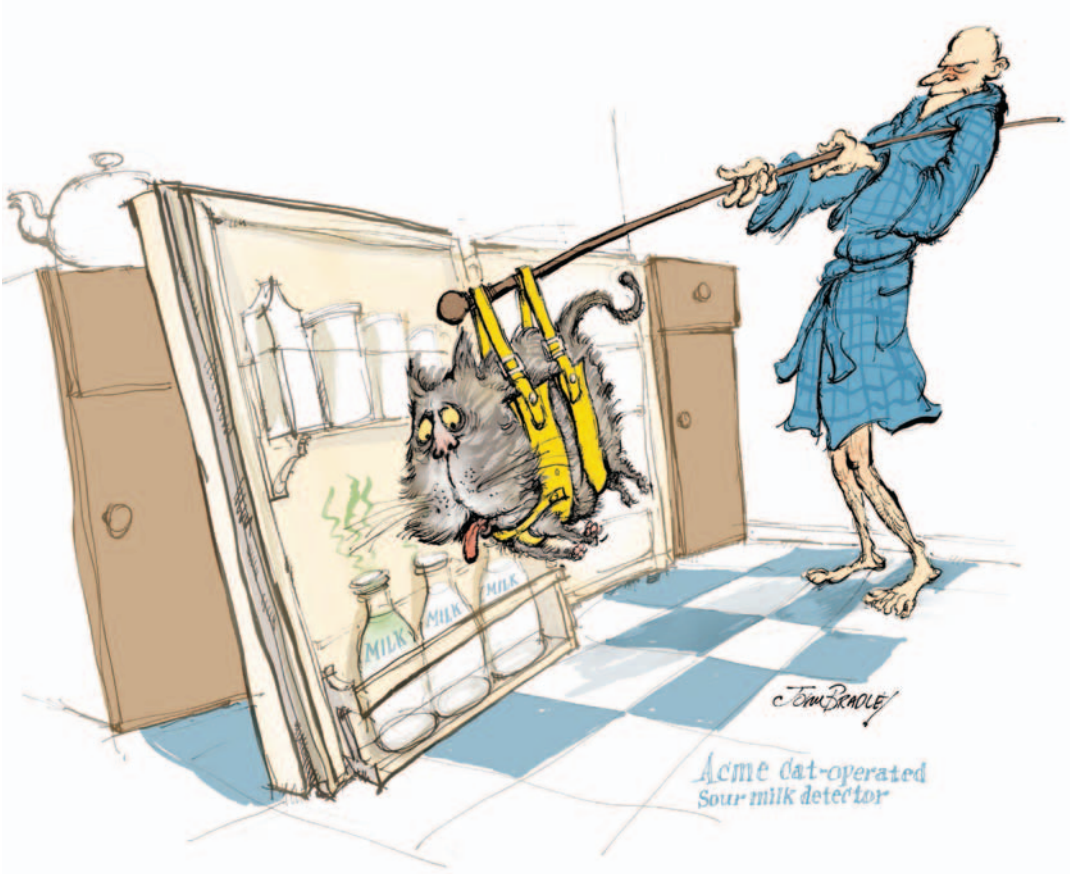
Crying over spoilt milk

The curse of 'off' milk is one that is familiar to most of us. But how can it be overcome?

In this nation of tea drinkers, milk is an indispensible item in most households. And, while some opt for soya milk or UHT, the vast majority prefers fresh cow's milk. The problem being, of course, that cow's milk doesn't stay fresh forever. Indeed, there can't be many of us who haven't tentatively sniffed the milk bottle in the hope of it being fresh, only to recoil with disgust when it becomes clear that it is not.

And it is precisely this scenario that leads to British households wasting 330,000 tonnes of milk every year. This so-called 'British milk lake', which is the equivalent of over 373 Olympic swimming pools, creates mass milk waste that contributes to approximately 190,000 tonnes of CO2 emissions. Of these 330,000 tonnes, 170,000 tonnes per annum are lost due to the product being thrown away products because it has not been used in time.

The problem, of course, is that there are a number of factors involved in keeping milk fresh. The temperature at which it is kept is vital, of course, as it how it has been processed, how long it has been on the supermarket's shelf and even how it is packaged. All these factors lead to wastage and unnecessary expense.



The Challenge

Our challenge this month, therefore, is to come up with a means of determining the condition of your milk without sniffing or tasting it, allowing the consumer to make a more informed judgement about when to use their milk.

Of course, the solution could be based on the odours and gases given off by the milk. Perhaps some sort of artificial 'nose' able to tell the difference between good and spoilt milk? Such a device may be possible, but it would be ruinously expensive for the average householder.

In conjunction with a leading designer, a British company has come up with a device to achieve this. The idea behind it is simple, but effective and uses a technology most of us will be familiar with from our school days.

Across the UK, the invention could represent a reduction of up to 100,000 tonnes in milk wastage per year, which in turn would reduce the UK's carbon footprint by approximately 190,000 tonnes of C02 (2% of the nation's total carbon footprint).

The solution will appear in next month's issue. In the meantime, see if you can come up with anything better.

The answer to last month's Coffee Time Challenge of how to ascertain how much gas is left in a bottle can be fouind in the Technology briefs section on page 8.

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Switches

SICK Launches Compact Optical Level Switch For Rapid Commissioning

SICK (UK) has added to its industrial instrumentation product portfolio with a new compact optical level sensor switch for aqueous fluids. Designed for robust level monitoring of a range of liquid media, the FDA-compliant MHF15 is ideal for a variety of applications, including tank level monitoring or dry running protection for pumps. The cost-effective plug-and-play solution, which requires no calibration and minimal maintenance, can be used for overfill protection and low level indication in tanks to monitor the presence or absence of liquids. A normally open or normally closed transistor output is provided for use as an input to control PLCs or relay modules. Due to its compact design, the MHF15 is ideal for difficult installations or conditions with limited space. Featuring a robust and highly resistant stainless steel housing and polysulfone apex the switch meets IP67 and IP69K standards, ensuring protection from dust, dirt and water; even during a caustic washdown routine.

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