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EUREKA

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WHEN THE WIND BLOWS ...

Design innovation drives the wind energy sector

Accurate OEM pumps

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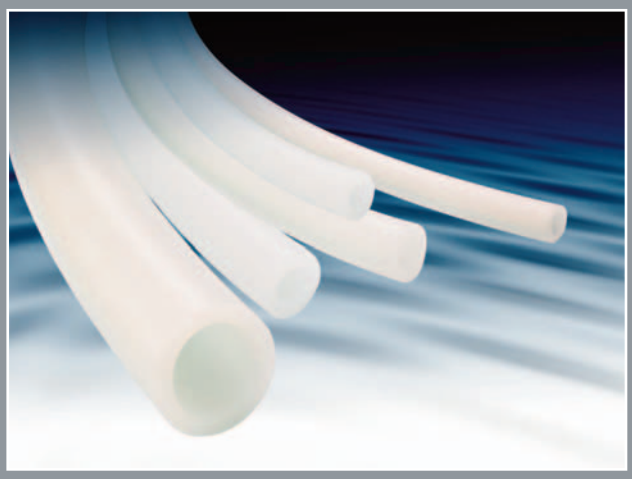

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WATSON MARLOW Pumps

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Are you hiding your light?

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

It could be argued that the UK has never needed its engineers to innovate more than it does now.

The recent economic downturn, an unprecedented budget deficit and a need to meet the targets set by the country's commitment to renewable energy sources mean the need to design and develop practical and commercially viable products has never been more urgent.

The UK may like to hide its light under a bushel when it comes to its engineering achievements, but surely it makes sense for there to be some recognition of those whose efforts have overcome significant technological obstacles to create products that are successful in both technical and commercial terms?

This is where the British Engineering Excellence Awards, or BEEAS, come in.

Now in their second year, the BEEAS are designed to recognise the best of UK engineering. Whether 'the best' means products, organisations or people, the BEEAS will have a category that is bound to suit.

You may imagine that your projects may, in some way, be too humble or mundane to be worth entering in such an event. You may imagine that your company is too small or little-known. However, the Awards are designed to to ensure that companies of all sizes can compete fairly, the Judges will take into consideration such factors as team size, project budget, project design cycle time, the regulatory environment, the competitive nature of the target market, the materials and technology selected by the design team and the attention to environmental issues.

More details are available on page 7 and at **www.beeas.co.uk**, while entries close on 31 July.

Is there something you're proud of? Why not let us know?

Concrete energy savings

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Cement producers are under intense pressure to improve productivity and reduce costs and environmental impact. The cement making process is a large consumer of electricity and fuel. To help solve their environmental and financial challenges, SKF engineer Keith Meyers applies SKF's life cycle management approach to the manufacturing process. The results are impressive. One cement producer reduced energy usage by 8%, which is equal to the annual electric consumption of 18,000 average European households, and increased Overall Equipment Effectiveness by 12%.

This is a great example of what we call Knowledge Engineering. And yet another way of how we apply our know-how by utilizing our wide range of products and services to help increase efficiency, save energy and reduce costs. Read the full story at **www.skf.com**.

The Power of Knowledge Engineering

Improve productivity, reduce costs

SKF Thermal Camera

Keith Meyers, SKF

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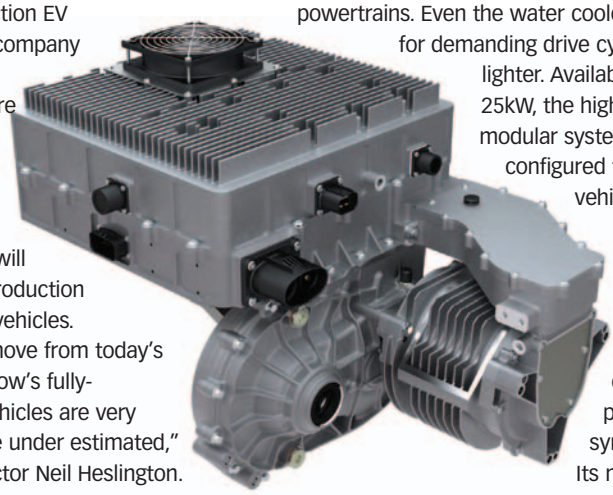
New powertrain simplifies next-generation EV development

An all-new Electric Vehicle powertrain is being developed by Zytek Automotive, a UK technology specialist with more production EV experience than any other company worldwide. Building on the knowledge gained from more than 15 years of niche EV design, manufacture and operation, this new third generation unit is a clean-sheet-of-paper design that will simplify significantly the introduction of next-generation electric vehicles.



"The steps required to move from today's low-volume trials to tomorrow's fully-homologated production vehicles are very substantial and must not be under estimated," says Zytek's managing director Neil Heslington. "Everything has to be re-evaluated, from development processes to dealer training. This new powertrain, combined with our substantial experience of EV and hybrid vehicle production programmes, will take time and cost out of this activity while helping to deliver the quality, refinement and driving experience that discerning customers demand."

The turnkey package is compact and, in air-cooled configuration, is up to 45% lighter than production EV powertrains. Even the water cooled version, suitable for demanding drive cycles, is up to 30% lighter. Available in sizes from 25kW, the highly integrated modular system can be configured for a range of vehicle sizes, applications and architectures.

At the heart of the powertrain is Zytek's high-efficiency permanent magnet synchronous motor. Its maximum speed of 14,000 rpm has enabled generated torque, and hence size, to be reduced considerably, bringing further reductions in cost and weight. When used in conjunction with the Zytek Electric Vehicle Control Module, torque delivery is scheduled in a way that further improves overall efficiency.

www.zytek.co.uk

The BEEAs are back!

The British Engineering Excellence Awards are back. The 'BEEAs' will be returning to the legendary Globe Theatre for The British Engineering Excellence Awards which will be held on Thursday 14th October 2010 at the Globe Theatre, London.

The Awards are designed to demonstrate and promote the quality of engineering design within the UK; to emphasise innovation and effectiveness in order to allow smaller companies to compete on an equal footing with larger ones; to act as an incentive to the design engineering industry to create world-class businesses; to provide a benchmark of excellence from which the industry can learn and from which it can build; and to demonstrate the power of engineering design innovation within the UK to the world.

Categories for the awards include: Design Engineer of the Year (sponsored by element 14); Young Design Engineer of the Year (sponsored by RS Components);Consultancy of the Year (sponsored by Prototype Projects); Small Company of the Year (sponsored by the Technology Strategy Board); Start Up of the Year (sponsored by Cambridge Consultants); New Product of the Year (Mechanical) (sponsored by WEG); New Product of the Year (Electronic); Mechatronic Design of the Year (sponsored by Rockwell Automation); the British Engineering Excellence Grand Prix (sponsored by the Electronics Leadership Council); and the Judges' Special Award.

Select whichever categtory is most appropriate.

You can either submit your entries online using the available forms or by post. Entries must be received by no later than 31st July 2010.

www.beeas.co.uk

beea
british engineering excellence awards

Briefs

BASA BACKS NEW ADHESIVES SHOW

The recently announced IASE – Industrial Adhesives, Sealants & Encapsulants Exhibition – has received industry backing from BASA – the British Adhesives and Sealants Association, which will run a technical seminar during the show at the National Motorcycle Museum, Birmingham on October 21st. IASE is a brand new event that brings together the UK's leading suppliers of adhesives, sealants and encapsulants which are used across manufacturing industry from processing and packaging to electronics and product assembly.

www.adhesives-show.com
www.abb.co.uk

BRIGHT YOUNG THING

A Swindon based student has won a bevy of awards at the Intel International Science and Engineering Fair in San Jose, California. National Science & Engineering Competition prize winner, James Popper, who attends Marlborough College, won multiple awards, including;

- Intel ISEF Best of Category award for Electrical and Mechanical Engineering worth $3000 plus a $5000 scholarship with a $1000 grant to his school
- An invitation to the prestigious 'Stockholm International Youth Science Seminar', an event where 25 of the world's best young Scientists and Engineers meet during the Nobel Prize Ceremonies
- The US Institute of Electrical and Electronics Engineers (IEEE) Foundation Presidents' Scholarship worth $10,000 over four years to a college of choice
- First place in the US Government Patent and Trademark Office Society award worth $2000 and Runner-up in The International Society for Optical Engineering award worth $1500

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Onboard verification offers greater precision

ABB's electromagnetic WaterMaster flowmeter has been integrated with what the company claims is the world's first easily accessible and in-situ flowmeter verification capability. Built into ABB's WaterMaster flowmeter, the VeriMaster system offers the ability to perform in-situ verification across the complete range.

The VeriMaster software tool takes advantage of WaterMaster's innovative and versatile attributes. Verification diagnostics monitor and validate across an impressive performance-wide matrix, whilst the latest precision flow measurement techniques are employed in the sensor with a revolutionary octagonal bore at core sizes.

www.abb.com

High-efficiency motors exceed standards

WEG's NEMA W22 range of high and premium efficiency three-phase electric motors offers the highest levels of energy efficient performance, reducing losses by between 10% and 40% when compared with competitive motor types. Designed in 2, 4, 6 and 8-pole configurations, the NEMA W22 motors exceed the requirements of the new IE2 (EFF1) High Efficiency, and IE3 (Premium) efficiency classes. Key to their improved energy performance is a new aerodynamic frame, which increases airflow and reduces operational temperatures, and also a repositioned motor terminal box, which optimises airflow over the motor.

The W22 NEMA range of 60Hz motors is initially available in frame sizes from 364T to 587T, with progressive introductions of smaller frame sizes during the next year. The range provides a package that delivers significantly lower energy consumption, lower noise and vibration, higher reliability, easier maintenance and lower cost of ownership.

www.weg.net

Innovative plastics create sustainable insulation

Through co-development efforts with SABIC Innovative Plastics, Japanese company Nissei has created a solution that reduces the environmental impact of wire harness insulation significantly. That solution is ECO-01 tubing, a wire insulation product made from SABIC's Flexible Noryl resin. This resin is inherently flame retardant (FR) and free of environmentally harmful heavy metals. It also provides OEMs of home appliances and other products with high heat performance without expensive secondary operations.

Flexible Noryl resin for wire insulation offers OEMs a better material choice compared to traditional polyvinyl chloride (PVC), which contains halogen chlorine. Not only is Flexible Noryl resin non-halogenated, to help customers meet global environmental requirements, but the FR material also surpasses PVC in wear resistance. As measured by the JASO-D-608-92 abrasion test, Nissei Eco found that Flexible Noryl resin has much higher abrasion resistance than that of PVC.

www.sabic-ip.com

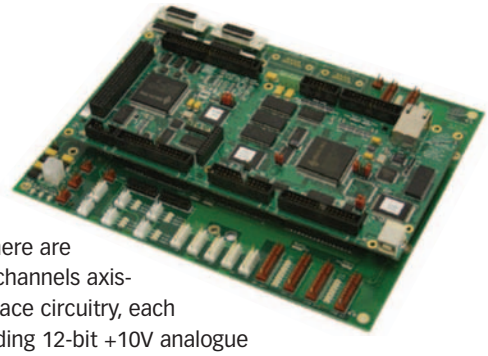
ANGLE SENSORS ENHANCE SUBMERSIBLE

When optimising the design of its new ASV 6000 coastal class semi-submersible vehicle, ASV selected Novotechnik GL series hollow shaft potentiometric angle sensors from Variohm EuroSensor. The devices provide rotary position feedback as an intrinsic part of in-house designed actuators used for the steering and ride stabilisation control system.

The ASV 6000, developed for hydrographic survey and surveillance work in shallow coastal waters, is operated remotely via a continuous GPS communications link. The relatively shallow submersion requirement for the ASV 6000 meant that actuators specifically for sub-sea use, operational at much greater depths, were massively over-engineered and consequently very expensive. Other commercially available actuators either did not provide angle position feedback or were not waterproof.

www.variohm.com

One-board control solution available



Delta Tau has developed the Turbo PMAC Clipper four-axis controller which has a one board control solution with I/O and Ethernet, plus Turbo PC/104 with Acc-2P and now comes with a 30% cost reduction. Through careful design and manufacturing for optimisation Delta Tau has brought the power of the Turbo PMAC controller family to cost-sensitive applications that could never afford this level of performance before. The Clipper include many features such as the Turbo PMAC CPU with Optional DPRAM and USB, Ethernet and RS-232 Communications (optional Ethernet Modbus).

There are four channels axis-interface circuitry, each including 12-bit +10V analogue output, pulse-&-direction digital outputs, 3-channel differential/single-ended encoder input, 5 input flags, 2 output flags and UVW TTL-level 'hall' inputs. In addition the Clipper has 32 general-purpose TTL-level I/O points, 'handwheel' port with 2 each: quadrature encoder inputs and pulse (PFM or PWM) output pairs.

www.micromech.co.uk

Aerotech grows nano Motion Technology range

Following closely behind the recent launch of single-axis and dual X-Y axis ANT series linear nanopositioning stages as a part of Aerotech's nano Motion Technology (nMT) range, two new rotary and two new vertical translation variants have now been introduced. With Aerotech's direct-drive ANT series now covering 95 mm and 130 mm wide linear and vertical-linear translation stages in addition to rotary and goniometric angular positioners, users can now specify long travel range, multi-axis nanometre resolution mechanics for high throughput production and demanding test and research applications. The new stages perfectly complement the outstanding precision, nanometre level precision and high dynamic performance offered by the landmark nMT range. The new ANT95-R and ANT130-R rotary stages comprise 95 mm and 130 mm diameter models with a positioning resolution of 0.1 arc sec and with a calibrated repeatability of just 2 arc sec.

www.aerotech.co.uk

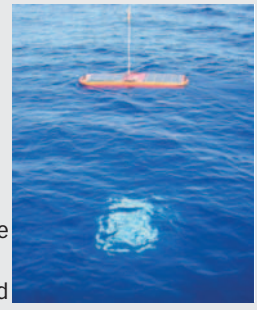
Solution to last month's Coffee Time Challenge

The solution to our challenge to design a commercially viable wave powered vessel exists in the form of the 'Wave Glider' a small autonomous surface vessel developed by Liquid Robotics, formed by a group of Silicon Valley engineers.

Intended for ocean surveying, monitoring and warning tasks, the device is 2m long, but has a towing unit on a 7m long, streamlined umbilical tether, which works underneath the waves. This has 12 wings which flex up and down as the vessel rises and falls, lifting and lowering the towing unit, which is deep enough to be below normal wave motion. As the wings flex, they have the effect of pulling the vessel forwards. The towing unit has a rudder, so the vessel can maintain or change direction.

Although it looks simple, director of scientific and commercial business, Justin Manley said: "There's a lot of mechanical complexity in there." Solar panels provide the small amount of power required to power the rudder motors and the electronics. A phase II development plans to use the rising and falling motion to provide the electric power.

It communicates data and receives instructions via the Iridium satellite phone system. Manley said: "We listen in to the AIS network and are pretty good at figuring out ways of keeping it out of the way of ships, even if they are fast and we are slow. If ships are not AIS, this adds complexity, but most of its work is targeted in the middles of oceans where ships don't go." This work is to monitor the environment, ocean currents, cosmic rays, tsunamis and undesirable activities. The vessels can be made to keep station, relying on GPS navigation, at a small fraction of the cost of a buoy, with a mooring line long enough to attach it to the bed of the ocean. The US military and security services have uses for them, since they are relatively small, cheap, easily deployable and can be made hard to find. Tests so far include 60,000 nautical miles of voyaging, including one individual journey of 6,200 nautical miles over 430 days and station keeping to an accuracy of 50m in Monterey Bay. Average speed is 1.5 knots.



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www.autodesk.co.uk/beyond3d

Image courtesy of Prensa Jundiai, Brasil

Turbine

As the UK ramps up its wind energy resources, Eureka looks at the technological challenges facing the sector and the innovations that are overcoming them.

With the country committed to generating 15% of its energy from renewable sources by 2020, the challenge facing the UK's energy industry is, by any standards, enormous.

But that bare figure almost serves to obscure the scale of the task. The issue is put into clearer focus when one considers that the level of renewable energy currently being generated in the UK is just 2% of the total and that the 4GW capacity that now exists will have to rise to more than 30GW by 2020. Or, to put it another way, onshore wind farms will have to increase the number of homes they supply with electricity from 2million today to 7m by 2020.

Whether this will be achieved and how remain major questions. As things stand, wind energy is clearly seen as leading the way. According to renewable energy business association RenewableUK, there are 4GW of wind plants installed and a further 9GW are either being built or have planning permission and are going into construction. By the end of 2012, it is estimated that there should be 10GW of wind energy operating in the UK. In addition, there are currently 10GW of schemes awaiting planning permission, meaning that more than 23GW of wind plant is in development in the UK, not including the 32GW of offshore wind licences recently awarded by the Crown Estates in the Round 3 process.

These figures may make the 30GW target by 2020 seem more achievable, but success will ultimately depend upon the technology employed to achieve it. Over a relatively short time, wind energy technology has advanced considerably in response to the lessons learned. Some of these lessons have been bitter. Failed wind turbines generally make for serious potential risk, damaging headlines and (as even the briefest search on YouTube shows) spectacular and popular footage. For this reason, much of the innovation of the past 20 years has been in increasing the reliability of wind turbines.

Wind turbines are not only under extreme mechanical strain, they are also exposed to high risks in terms of storm, lightning, fire and ice. Because of the extreme strain on the materials, there are often high damages. The insurance industry demands more time for the development and test of new constructions, and higher standards for maintenance and repairs. Replacing a gearbox in a large wind turbine normally requires using a crane capable of lifting more than 100 tonnes to and from a height that can be more than 100m. As can be imagined, that is a costly process, both in terms of the replacement costs and the lost power generation time, particularly as such failures will usually take place in winter when the wind is at its strongest and cannot be replaced until the following spring or summer.

Gearbox bearings are a common source of turbine failure. The high dynamic loads to which wind turbine gearboxes are subject are one problem, but another is the variability in load due to changing wind condition. The variation in load spectrum from high peak to low loads places considerable – and often contradictory – demands on the bearings. The high static safety required for maximum load means that bearings with high load-carrying capacity are required, but when there is little wind and loads are low, this can lead to damage due to sliding of the rolling element set.

A consortium led by engineering consultancy Ricardo has developed a possible solution to this problem that could increase bearing life fivefold. Investigation by Ricardo showed classic fault categories, such as unequal load distribution applied to the bearings in epicyclic gears, or running at partial turbine power, when the rolling elements are prone to skid rather than roll and cause scuffing of the precision ground surfaces. Whatever the cause, however, wear on the inner bearing ring is invariably concentrated over a small arc of some 40°, while the remainder of the ring remains unworn. Says Dr Jonathan Wheals, chief engineer at Ricardo:"We thought if the inner ring only suffers damage over a 40° arc, what if we indexed it around so that the wear was distributed more evenly?"

The solution the consortium designed involved a conical clamp forced between the inner race of the bearing and its associated shaft by means of a large Belville spring. The clamp is actuated by an oscillating piston acting on a roller ramp using a single pulsed hydraulic supply from the bulk gearbox oil. The same mechanism is then used to rotate the race. The mechanism achieves fully failsafe operation because, if the oil pressure fails at any stage, then the device is spring-driven to a state in which the race is locked to the shaft.

An actuation ring drives the roller ramp and is itself held in place by a spring-loaded pawl. If pressure is lost at any stage,

technology gears up

then the anti-reverse pawl disengages and the mechanism unwinds under the action force of the conical spring acting upon the roller-ramp mechanism.

Because it is critical to know the exact degree of bearing rotation, a 'percussion bell' is used to amplify the sound made by the pawl as the actuation ring is rotated. By analysing these sounds using existing condition monitoring systems, it is possible to determine the position of the bearing accurately.

While the incremental costs of these bearings are estimated as being around 35% more than existing solutions, the cost savings possible in terms of O&M would more than compensate for this. The system is currently being prototyped in conjunction with a large bearings manufacturer, while testing will take place at Ricardo's Leamington facility.

As increasing numbers of wind turbines move out of their manufacturers' warranty period, third party suppliers are increasingly in a position to apply new technologies to increase the longevity and reliability of existing turbines. As Dr Wheals puts it: "Retrofit is very attractive because many turbines have ailments and are coming out of their warranty periods."

Clearly, the wear and tear on gearboxes means that monitoring is another key technology for avoiding failures. According to Matt Fielder, Wind Energy manager of Parker Hannifin Europe's Hydraulic Filter Division, the use of the latest particle counting technology and telemetry systems are being used to extend the life of these systems.

Says Fielder: "Offshore wind turbines in particular take an absolute pounding and if you look at the mean time between failure rates of some of these things, they're not actually that great. One of the most common failure areas is obviously in the gearbox, and an offshore gearbox is not an easy thing to replace. The ability to be able to determine or monitor when you are going to have a catastrophic failure as a result of wear metal debris build up in the oil, is something that's not really been looked at.

"They use these things called wear metal sensors, which are monitoring the large pieces of debris coming from gear teeth and bearings in the turbine, but what the hydraulics industry has been doing for many years is using laser particle counting to monitor the much, much finer particles of contamination that are building up because of wear metals failure."

One of the solutions is to undertake particle counting, but, says Fielder: "One of the problems we face with the gearbox industry is that we're using very high-viscosity oils and also we have 'splash feed', which means we have a lot of air bubbles in the oil. One of the problems with particle counting is that you have to make sure there are no air bubbles in the oil or that gives spurious readings. So what we're doing is developing a system to extract oil from a gearbox, pressurise it to in excess of 100bar to suppress any air bubbles and that enables us to give a proper count."

Another innovation being employed by Parker to extend gearbox life

Matt Fielder: "If you look at the mean time between failure rates of some of these things, they're not actually that great."

is to employ larger filter housings to prevent bypass of oil on cold start-up. Says Fielder: "If you imagine you have a turbine with 300cts oil in the North Sea and the oil is at 2 or 3°C. The oil will be very, very thick – in excess of 1000cts. With a lot of filters, if they're not correctly sized then they will go into bypass straight away, which allows dirty, contaminated oil to go past the filters and straight into the gearbox. So we're trying to develop systems that prevent bypass on start-up."

Also a threat to bearings is the fluting or pitting caused by a build-up of electrostatic energy resulting from the current that runs down the shaft between the generator and the gearbox being insufficiently grounded. While Morgan Carbon's European electrical director Rob Threapleton concedes that this may not be the largest cause of gearbox failure, he nonetheless believes it to be a significant factor. "I do think there is a universal problem with grounding of shafts."

Ricardo's solution involves a mechanism for indexing the bearing to distribute wear more evenly

With this problem in mind, Morgan Carbon is currenty developing a product based on its existing 'Aegis Ring' (a grounding ring shown to be highly effective in other applications). Says Threapleton: "We are developing this technology alongside another company to be suited robustly and effectively for the wind market. It potentially can guard against generator and gearbox problems, which are the biggest threat in terms of O&M costs and will potentially save the industry hundreds of thousands of pounds." The solution is currently under test.

Of course, one of the best ways to avoid gearbox problems is to dispense with the gearbox altogether. Increasingly, direct drive systems have been developed. The last couple of years has seen the emergence of commercial-scale, direct drive permanent magnet generator [PMG] systems, with the hub directly connected to the generator. In order to achieve this, however, a much larger diameter generator is required, to accommodate the required increase in the number of magnetic poles on the rotor.

The result is a system with significantly increased reliability and reduced maintenance costs. Reduced downtime for maintenance also means less non-producing time offline. The elimination of associated mechanical losses that are inevitable with gearboxes, also leads to improved efficiencies in the power conversion process. The generator itself is also more robust than conventional systems, and gives greater efficiencies when wind speeds are not at full rating, compared to the earlier designs.

Stephan Ritter, GE's general manager Renewable Energies in Europe, revealed that the company acquired the Norwegian company Scanwind because it makes direct drive wind turbines that do not require gearboxes. There are currently 14 of its 3.5MW 90m turbines operating in the Hundhammerfjellet wind farm on the West coast of Norway. Ritter says the company used permanent magnet generators 'as a big as a Dutch house' and the whole nacelle weighed 'around 250 tonnes'. The plan was to make the design more commercial, although Ritter remarked: "We are going to change it as little as possible. Reliability is what we are going to focus on as well as a bigger rotor, taking capacity to 4MW. This year," he says, "we will be onshore, but the next step is wet feet, then scale production up slowly to 50 to 100 units, with first commercial products in the water in 2013."

The advantages of direct drive wind turbines are clear: to simplify the nacelle systems, increase reliability, increase

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As a result, Schaeffler's low friction rolling bearings, designed to achieve a minimum of 20 years operational life, are now the preferred option to support the rotor, alternator and gearbox in wind turbines throughout the world.

Schaeffler double row spherical roller bearings, radial ball bearings and maintenance free spherical plain bearings are also playing a vital role in wave and tidal stream systems under development.

And, to complete the picture, Schaeffler online condition monitoring systems provide advance warning of any potential problems, enabling remedial action to be taken as part of planned maintenance intervals.

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efficiency and avoid gearbox issues. A general trend towards direct drive systems has been evident for some years, although there are considerable challenges in producing technology that is lighter or more cost-effective than the conventional geared drive trains. Although these developments continue, direct drive turbines have not, as yet, achieved a sizeable market share.

The problem with direct drive and PMGs is that they are expensive and demand huge quantities of permanent magnet materials. Scanwind's 3500 DL wind turbine, rated to 3.5 MW of power, uses more than 2000 kg [4400 lb] of high energy neodymium-based [Nd-Fe-B] permanent magnet material. This equates to approximately 0.6 kg [1.3 lb]/kW produced.

Dr Wheals of Ricardo Engineering is sceptical about the long-term viability of the permanent magnet-based solution precisely because of the size of magnets necessary. "Such has been the gearbox failure rate with wind turbines," he says, "that it has given an impetus to people to find other solutions rather than improving the gearboxes. Many suppliers have taken fright and moved to direct drive, but in terms of mast top mass reduction, it's precisely the wrong solution." He also points out that China's intention to reduce its quota of rare earth materials (from which permanent magnets are made and of which China produces 95% of the world's supply) to just 35,000 tons per year by 2015 may well mean that 'there won't be enough neodymium, even if we want it'.

Dr Gary Taylor of Brunel University's Institute of Power Systems acknowledges these problems, but is less pessimistic. "There are issues with permanent magnet generators in terms of size, materials

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Bearing damage represents the single most common source of turbine gearbox failure

and decommissioning, but it is being taken seriously by a lot of OEMs." However, he does concede that the notable exception is Vestas, the world's largest manufacturer of wind turbines, which has stuck with geared machines.

An alternative to the direct drive system can be seen in the 'hybrid' drive train employed by Clipper Wind, which manufactures 2.5MW wind turbines. After initial research into systems with multiple induction generators, Clipper developed a system with an innovative gearbox with outputs to four permanent magnet generators. As with other hybrids, this again leads to a very compact drive train. Clipper Windpower Marine, a subsidiary of Clipper Windpower, has obtained £4.4 million DECC (UK Department for Energy and Climate Change) funding for development of blades in the 'Britannia Project', a 10 MW offshore wind turbine scheduled for deployment in 2011 and being built in Tyneside.

The question of how to generate these higher levels of energy from wind turbines is a vexed one. There are strong suggestions that the answer will be found in the use of high temperature superconducting [HTS] materials in the generator systems. Such materials allow significant increase in power density compared to wound copper or permanent magnet machines, as well as potentially offering significant benefits in terms of size and weight. One of the companies involved in this research, AML Energy, is working to incorporate its proprietary Double-Helix technology into a 10 MW direct drive HTS generator system for wind turbines. It claims that this technology, once proven, will be scalable to 20 to 30 MW power outputs. It reports that the design will be 75% lighter and 50% smaller turbines than the best turbines available today, with greater efficiency and reliability of operation.

www.renewable-uk.com
www.ricardo.co.uk
www.parker.com
www.morgancarbon.com
www.ge.com
www.clipperwind.com
www.amlcleanenergy.com

"There is undoubtedly a perception among parents, teachers and even the further education universities that a career in engineering is less satisfying than one in other sectors such as financial services. We've got to change that perception and the only way we can do that is to see continual and prolonged investment."

A career to emulate

Allan Cook, a chartered engineer with more than 30 years' global experience in the automotive, aerospace and defence industries, is chairman of Atkins.
Atkins, the UK's largest engineering design consultancy, is working on some of the world's most technically challenging and time-critical projects.
Prior to Atkins, he was chief executive of Cobham PLC, and previously held senior positions with GEC-Marconi, BAE Systems and Hughes Electronics. He was awarded a CBE in 2008.

Smoothing the career path

Semta is at the forefront of addressing the skills crisis and now there is a new man at the forefront of Semta. Paul Fanning reports.

"My father had his own business as an electrical contractor and I worked with him nights and weekends – whenever he'd let me, really. So as far back as I can remember – from when I was eight or nine years old – I've been taking things apart and putting them back together again. It seemed to me that it was logical that I go into engineering. What else was I going to do? It's been a fantastic career for me."

The path Allan Cook CBE, the chairman of engineering design group Atkins, followed to become an engineer will sound familiar to many. However, it is one he fears may not be followed by others with similar inclinations without consistent support and investment in the manufacturing and engineering sectors. And it is with addressing this issue in mind that Cook has taken over from Sir Alan Jones of Toyota as chairman of employer-led Sector Skills Council Semta.

The message of how rewarding and fulfilling a career engineering can be is one that Cook is keen to get across and is something of which his career provides ample evidence. With more than 30 years' global experience in the automotive, aerospace and defence industries, he was chief executive of Cobham PLC before joining Atkins and previously held senior positions with GEC-Marconi, BAE Systems and Hughes Electronics. He was awarded a CBE in 2008.

For all that, Cook is aware that the public image of manufacturing still leaves a great deal to be desired. He says: "There is undoubtedly a perception among parents, teachers – and even the further education universities – that a career in engineering is less satisfying than one in other sectors, such as financial services. We've got to change that perception and the only way we can do that is to see continual and prolonged investment."

Without this investment, Cook believes, manufacturing cannot convey the image to attract the right type and number of skilled people. "Youngsters coming into industry are looking for a career path that's going to be rewarding from a monetary perspective and from the perspective of job satisfaction," he says. "They want to be working in a good environment with modern tools and they want to be working on interesting projects. And, of course, you can't do that if there's no investment going in. It's a stagnation effect."

Of course, where this investment will come from in an economy where public spending is going to be severely restricted is another matter, but Cook feels that there is a growing recognition of the value of the manufacturing sector and anticipates support from the new Government. "Amongst politicians, trade associations and in government circles, they all recognise that manufacturing is a positive contributor to GDP and we're not either generating or training enough of our skilled people into the engineering, manufacturing, science and technology sectors. The previous government acknowledged this and was investing in it and I'm absolutely certain that the new government will have the same approach in terms of developing that because it's an integral part of what it needs to do to get this economy working again," he says.

This recognition has not always been there, however. Something Cook acknowledges when he says: "There has been a period of time – and not in immediate history – when manufacturing and engineering were not perceived as being as critical to our Gross Domestic Product. I don't want to be specific, but a lot of people believed that anything that was going on outside the M25 was not as important as what was going on inside the Square Mile."

That manufacturing is a good investment is another point that Cook is keen to emphasise. "It's a net-net contributor, so what we're talking about is something that is going to give the country a significant return on its investment. For every pound that is invested in the manufacturing sector, it's estimated that we make £20."

Recognising this and actually doing something about it, however, are two different things. Says Cook: "Historically, I think there has been a recognition that investment in skills will give a good return. Part of the problem is that, from a business point of view, you always want to have tangible proof of a return on an investment and in many, many ways, it can be quite difficult to see because this sort of investment is quite long-term. The real issue is that if we don't make this level of investment, the repercussions are potentially horrific."

This is not solely a problem for Government, however. Cook believes that industry, teachers, careers advisers and many others have a role to play. "I think it's about educating the people who make the decisions throughout all walks of life that this is a really, really important part of the curriculum and is absolutely critical to the future development of the UK," he says.

"We do a lot of really neat things in this country, but perhaps we have had a history of hiding our light under a bushel. Far too often, we see youngsters who say 'No-one told me you did this. No-one told me this was a potential career path'."

www.semta.org.uk

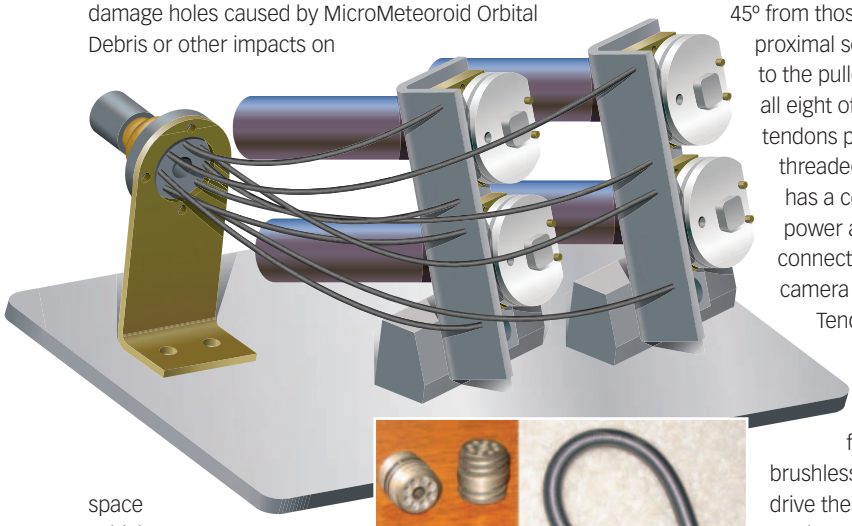
Photograph: Stuart Wilson

Robotic tendril gets into tight spaces

Tom Shelley reports on an ingenious technology developed by NASA.

A robotic 'Tendril' has been devised that can insert itself into the tightest places. Invented for use in space, its constructional basis is simple enough to make it attractive for a multitude of other uses, including keyhole surgery, inspection and maintenance tasks inside hard-to-access machines.

Its inventor is a team of engineers at the Johnson Space Center in Houston, Texas and its original purpose was to be able to inspect deep into crevices, under thermal blankets, or down damage holes caused by MicroMeteoroid Orbital Debris or other impacts on space vehicles.



For such purposes, it needed to be at least 100 times as long as it was wide and able to support a small video camera on its tip.

Its basic construction is as a series of extension and compression springs joined by threaded links. The extension spring sections provide passive bending along the majority of the Tendril's length, while the compression springs allow active bending under the action of antagonistic tendons. These run along the length of the Tendril and terminate at one end within the Tendril and at the other end on pulleys. When a particular pulley rotates, one tendon in a pair is retracted and the other is allowed to extend. This causes a compressive force on one side of one of the compression springs, making it bend. Each of the Tendril's two bending sections is equipped with two pairs of tendons, routed perpendicular to each other. The current design has two 8cm bending sections actuated by 0.25mm diameter 'Spectra' gel spun polymer tendons.

The tendons that control the distal section (that furthest from the pulleys) are offset 45º from those that control the proximal section (that nearest to the pulleys). In addition to all eight of the actuation tendons passing through the threaded links, each link has a central bore for power and video connections to the CCD camera mounted on the Tendril's tip.

The actuation assembly consists of the four pulleys and brushless DC motors to drive the eight internal tendons, as well as a routing structure to direct the tendons into the Tendril. The tendons pass through PTFE tubes both in the routing structure and in the Tendril itself in order to reduce friction. The 2.5cm diameter pulleys are sized in such a way that their full range of motion allows for more than +90° movement in both pitch and yaw at each bending section. The actuators produce 0.4Nm torque, which is more than sufficient to overcome the effects of gravity when the Tendril is hanging vertically.

The body housing accommodates the withdrawn Tendril on a reel, as well as a body rotation actuator. A spiral groove is formed into the circumference of the reel to guide the Tendril during extension and retraction and to confine it to a single layer during multiple revolutions of the wheel. The reel is driven by another brushless DC motor that produces 1.7Nm of continuous torque at 120 rpm, which is more than sufficient to drive the Tendril at 5 cm/s.

The body rotation creates a roll axis for the Tendril when the tip is straight and gives the Tendril an auxiliary means of panning a full 360º when it is bending. The actuator also uses a brushless DC motor, producing 2.5Nm of continuous torque at 91 rpm and a holding torque of 24.5Nm. An absolute position measuring device with an inductive sensor was custom designed for the application. This both relates the rotational motion of the reel to the linear motion of the Tendril and acts as a hard stop to prevent it either over extending or over retracting.

Full details including engineering drawings may be downloaded from the NASA Tech Briefs website **www.techbriefs.com**. Anyone interested in licensing the technology or in further collaborative developments should contact the Johnson Space Center **jsc-techtran@mail.nasa.gov**

Design Pointers

- Tendril is 100 times as long as it is wide and can bend in two places
- It is made up of compression and extension springs with four pairs of antagonistic tendons running inside it
- As well as being able to bend in two places, it can be extended from and retracted back into a reel, which can itself be rotated, giving an additional degree of freedom

Robots work together

Tom Shelley reports on first commercial applications and the potential shown by collaborating robots.

By moving in swarms or flocks, co-operating robots can collect items and deliver them in an optimum order for loading or incorporation into products.

Much of the development has been for military purposes, to improve communications between motor vehicles so as to improve traffic flow and reduce accidents, to work together to find things and as pure research, to create robotic football teams that compete in the annual 'Robocup', being held this year in Singapore .

Dr James McLurkin, who is an assistant professor at Rice University in Houston, Texas, and one of the pioneers of the idea, takes his inspiration from the insect world. "Presently, very few robots can even open a door, while a cockroach that has been knocked over is able to recover its position in 27ms."

With this in mind, the success of insects working together and flocks of birds flying together has encouraged him and other researchers to develop robots that can work in groups. In the case of his robots, they communicate with each other by infra-red links and with their central programming computer by low power wireless. They also have cameras and force feedback from a chip sensor, so they can be used to move towards something and push it. Dr McLurkin said his team is moving towards a manipulator system.

Much of Dr McLurkin's research has focused on creating network trees and implementing distributed algorithms. These enable the robots to act as a group. An example task could be performing a joint search, useful when trying to quickly locate somebody trapped in a building.

Dr McLurkin has also demonstrated that it is possible to get the robots to arrange themselves in a particular order, and it is this capability that has enabled Kiva Systems in Massachusetts to develop its revolutionary warehouse storage and retrieval system. The Kiva Mobile Fulfillment System consists of units that can engage shelved storage pods from underneath and then carry them around.

Instead of being stored in static shelving or carousels, products are stored in pods in the centre of a warehouse, while operators stand at inventory stations around the perimeter. When an order is received, the robots retrieve the appropriate pods and bring them to the worker, who picks out the appropriate item and places it in a carton. Completed orders are stored on separate pods, ready to go and be moved to the loading dock in an optimum order when the delivery truck arrives.

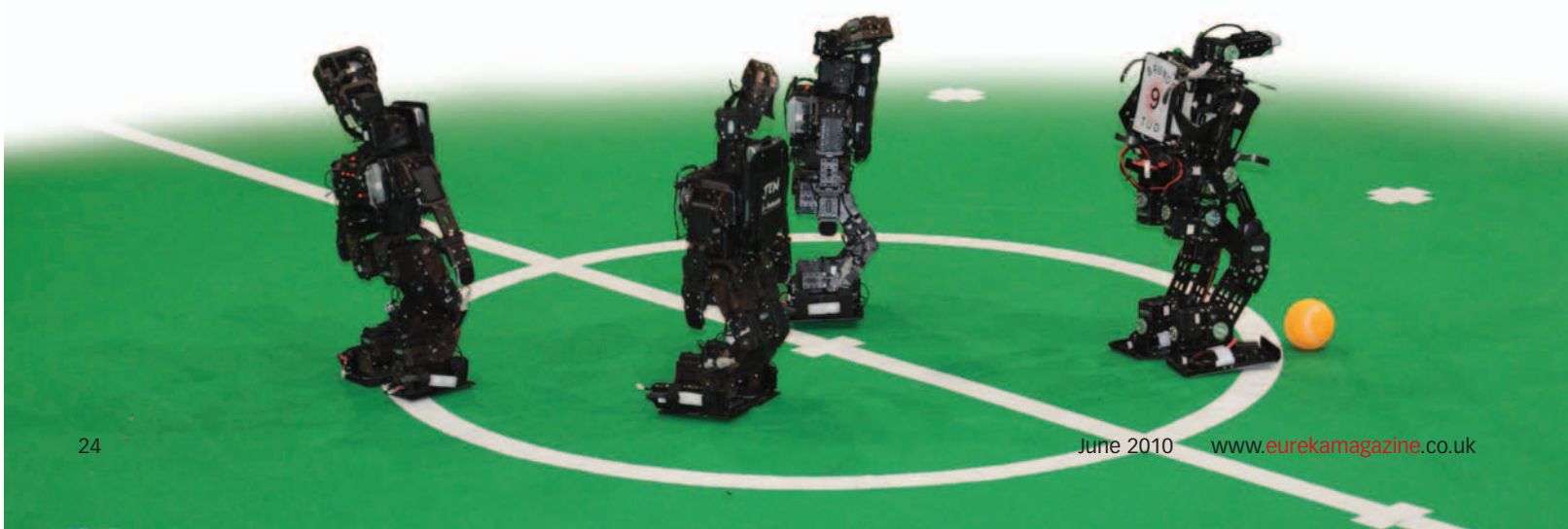
The items can also be stored dynamically, in order that fast-moving items can be stored in a way that allows them to make the fastest possible journeys to the person doing the picking. The system could be used in automated industrial manufacturing, but it presently seems to be finding greatest favour with US online mail order companies. Recent users include: Diapers.com and Saks Direct, which recently purchased 60 robots and 1500 storage units.

Both Dr McLurkin's robots and those developed by Kiva Systems were designed using SolidWorks.

www.kivasystems.com
www.solidworks.co.uk

Design Pointers

- Collaborating robots can arrange themselves in order, to deliver items in a desired sequence
- In search mode, they can greatly reduce the time taken to find items, and can quickly reconfigure the swarm if individual units cease to be functional



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Drive cleans up at Dyson

An ABB drive has helped Dyson improve dust extraction at its Wiltshire research and development centre, saving the company over £6,000 a year on energy costs.

The test facility puts new Dyson vacuum cleaner prototypes through their paces with a battery of tests that include their ability to remove dust from surfaces. The dust produced for these tests needs to be extracted eventually to maintain a safe and healthy atmosphere and this is done at several test points using a motor driven fan. Originally switched direct-on-line (DOL) via a star-delta arrangement, this motor drew a large starting current that was causing fuses to blow regularly.

ABB Drive Alliance member APDS fitted a 55kW ABB standard drive as a trial. A pressure sensor was installed in the ducting near to the drive to measure the vacuum pressure in the system, which is used to determine the flow rate needed. Test stations can either be in operation or idle, causing the demand for extraction to vary, so the drive changes the fan speed instantaneously to match this demand.

www.abb.co.uk

Servo drive has built-in motor wizard

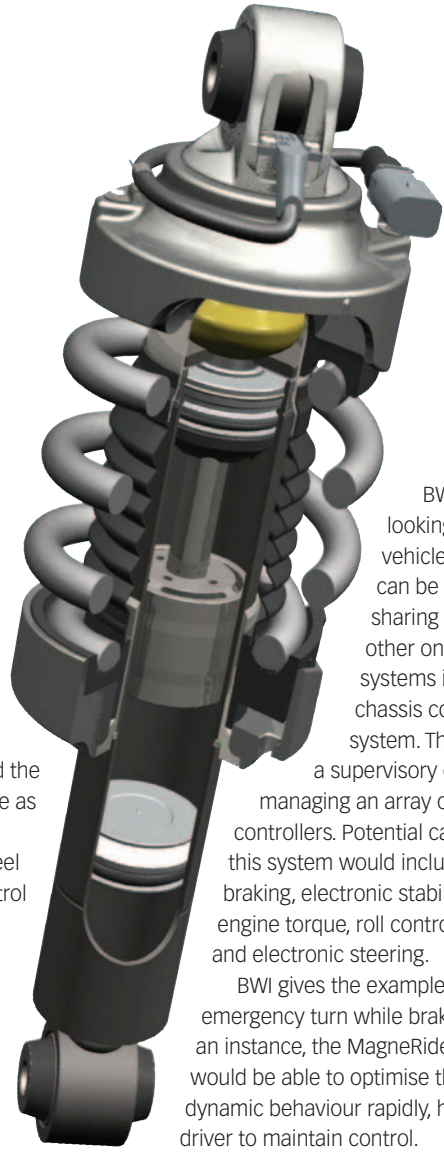
The new Ormec XD Series of Indexer Servo Drives from Inmoco has a built-in motor wizard that functions with most types of servomotors, allowing easy integration. Also helping fast integration and commissioning are the XD Series' 32 motion profiles, and comprehensive software tools, which can reduce set-up times in complex applications from days to minutes.

The XD Series is designed to provide high performance and reliable motion control capabilities in demanding applications such as intelligent conveyor control, pick and place units, labelling systems, flying shears, rotary knives, scanning systems, high speed printing and part storage and retrieval. In addition, the unique built-in features of the XD Series allow it to support otherwise difficult application requirements, such as tension control, dual loop feedback, registration, gearing and many more.

www.inmoco.co.uk

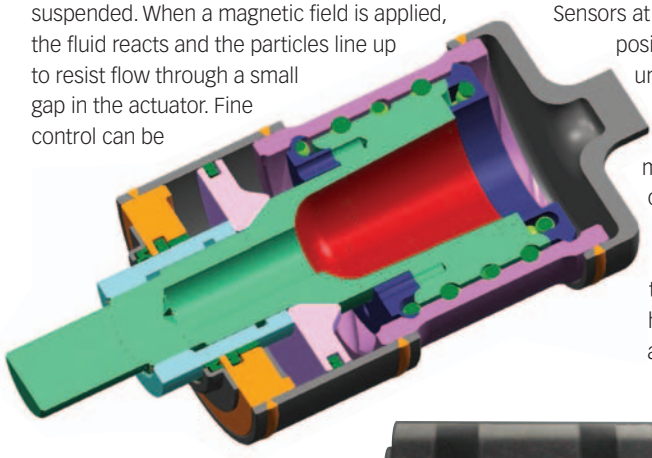
Electromagnetics offer smoother ride

An innovative suspension control system is offering automotive designers much greater freedom. Graham Pitcher reports.



Automotive design specialist BWI has introduced the third generation of its MagneRide suspension control system. The system uses dampers whose response can be changed by controlling the properties of the damper fluid electromagnetically.

The fluid is a suspension of magnetically soft particles in a synthetic hydrocarbon base fluid. Mike Zimmerman, manager of controlled suspension systems development for BWI, explained: "The system is based on a magneto rheological fluid in which iron particles are suspended. When a magnetic field is applied, the fluid reacts and the particles line up to resist flow through a small gap in the actuator. Fine control can be applied because the level of resistance varies with the flux applied."



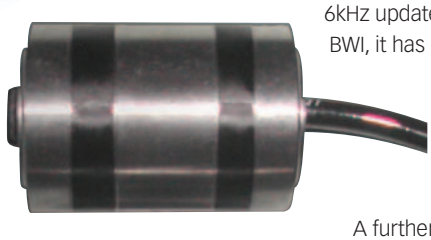
When the coil through which the damper fluid flows is not energised, the particles within the fluid are distributed randomly and the fluid behaves conventionally. When the coil is energised, the particles align and form fibrous structures and this resists flow. By changing the current applied to the magnetising coil, a wide range of damping forces can be applied.

The fluid retains the same viscosity, no matter whether the electromagnetic force is applied or not. When the force is applied and the particles line up, the shear force of the fluid changes dramatically and the alignment needs to be sheared if the fluid is to move.

In automotive applications, MagneRide is available in two sizes; working with dampers of 36 and 46mm diameter. The pistons are 30mm long and the gaps through which the fluid flows can be as small as 0.5mm.

Sensors at the wheels determine wheel position and an electronic control unit (ECU) calculates relative wheel velocities and whether the car body is moving up or down, rolling or pitching.

The ECU then issues commands to each coil to maintain acceptable handling and comfort. Signals are issued at a rate of 1kHz, but the dampers can respond to a 6kHz update rate. According to BWI, it has concentrated on getting current to the damper quickly in the latest version of the system.



A further enhancement has been to allow the fluid to be demagnetised more quickly in order to speed system response. By applying a dual coil approach, the system's range has been broadened to include a 'softer soft' and a 'harder hard'. This allows the suspension to become more or less flexible more quickly.

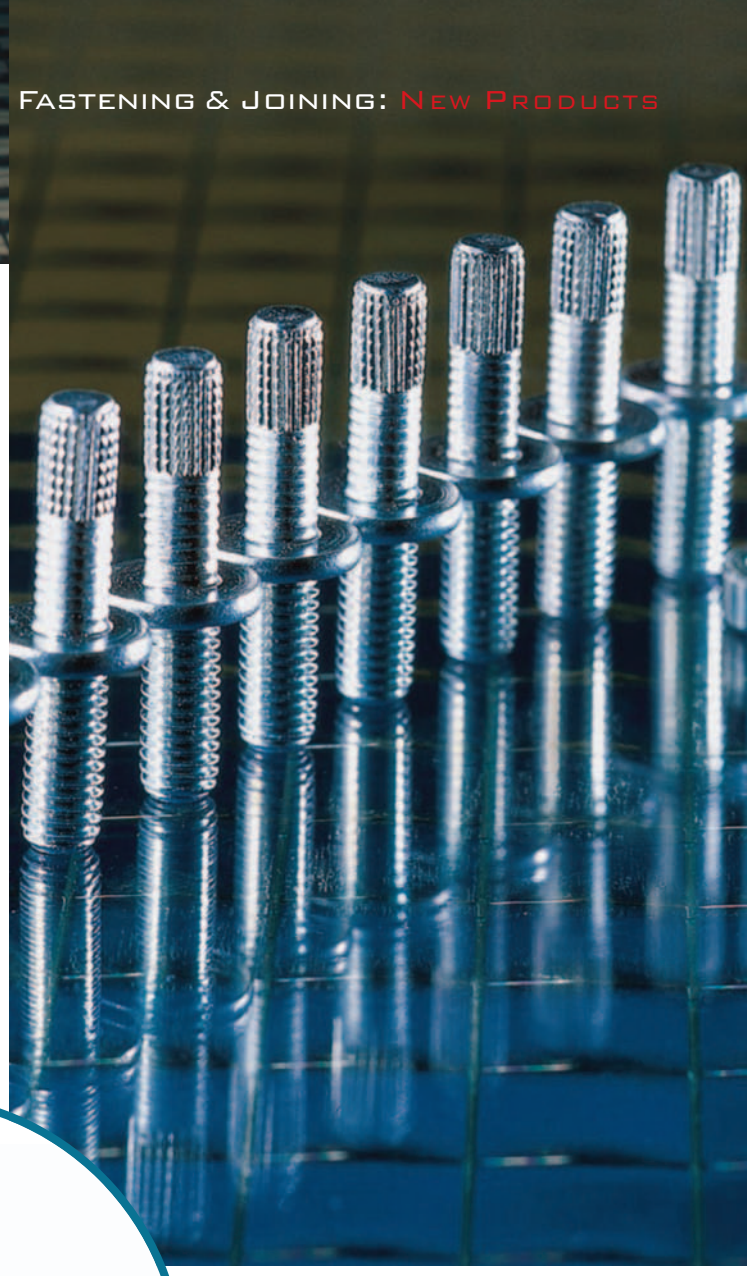
BWI is now looking to see how vehicle dynamics can be improved by sharing data with other onboard systems in a global chassis control system. This would see a supervisory computer managing an array of subsystem controllers. Potential candidates for this system would include antilock braking, electronic stability control, engine torque, roll control, dampers and electronic steering.

BWI gives the example of a severe emergency turn while braking. In such an instance, the MagneRide system would be able to optimise the vehicle's dynamic behaviour rapidly, helping the driver to maintain control.

Olivier Raynauld, manager of forward engineering controlled suspensions, commented: "The main barrier to this level of integration is the need for a standard high speed communications protocol implemented by the manufacturers of each system. We are participating in various consortia, including FlexRay, to develop the infrastructure that will support safe and reliable collaboration between the many chassis subsystems in today's vehicles."

BWI believes the MagneRide system may have application beyond automotive suspension systems. "We are looking at other markets," said Zimmerman, "but we haven't anything to talk about as yet. But we think the technology is applicable to controlling any vibrating system." However, the company has identified wind turbines as a potential application for the technology.

www.bwigroup.com



Fastening solutions evolve

Tom Shelley reports on the latest developments in fastening and joining.

Fasteners continue to evolve, not only to reduce costs, but also to meet the needs of the new Machinery Directive, which requires all guards and enclosures to have captive nuts, and to go even further to meet safety and reliability issues.

To meet such needs, Eureka readers may recall a description of how the Japanese 'Hard Lock' vibration-resistant nut system is expected to reduce the risk of nuts coming undone in railway points *(Eureka, April 2010)*. But a British development that is said to work even better is being taken up by the rail industry in The Netherlands.

'Wheelsure' and 'Tracksure' nuts are the result of a British Inventor coming up with an improvement to a century-old idea: Two nuts on a bolt, one of which runs on a main, right handed thread, and the other of which runs on a left-handed thread on a narrowed diameter section of the outermost end. The key to making it work effectively, according to Wheelsure CEO Gerhard Dodl, is a push on cap to keep the hexagonal protuberances of the two nuts in alignment, and a spring clip in either the cap or on one of the nuts, to hold the cap in place.

Any vibration causing the main, inner nut to start to undo makes the two nuts lock together. The combination performs well in the Junkers vibration test, retaining 95% of clamp torque over the maximum 120s, and target initial markets are heavy goods vehicle wheel studs and the rail industry. There has been a significant order for use in a marshalling yard braking system for handling freight trains in Rotterdam. It is also approved in Italy and there is talk of trials on the London Underground. On the road, it is fitted to various goods vehicles, including more than 300 aggregate trucks owned by building products supplier, Cemex. The studs come in two sizes, M18 and M22, which fit the majority of wheel hub assemblies.

For non-critical applications, most design engineers continue to specify threadlocking compounds.

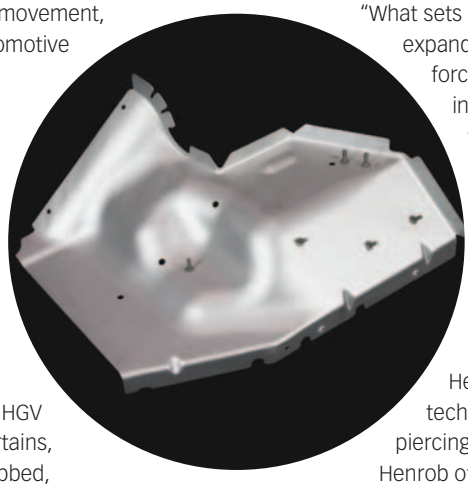
Henkel Loctite says that it has recently reformulated its 243 and 270 threadlocking compounds to make them function better on a wider range of metal surfaces, including passivated and trivalent chrome and to be more tolerant of oil traces. Service temperatures are now up to 180ºC instead of only 150ºC.

A number of suppliers claim to have been doing good business supplying captive fasteners to meet the new guarding requirements arising from the Machinery Directive. Graham Leo and Roy Adkins of Specialty Fasteners and Components showed a new design in which bolts are retained by a thread that is of larger diameter than the bolt shank. The thread is rolled on after a spacer has been swaged on that attaches to the guard. Unifast, on the other hand, has chunky push and turn Italian made fasteners retained by an elastomeric, pushed on washer and Camloc has a quarter turn 'CAM-PT10' fastener (pictured, left) that is claimed to have a grip range '7.5 times wider than other quick release fasteners'. It too is retained by a plastic washer.

David Antrobus, operations director of Binder Fastener Systems (UK) highlights the company's 'Klettostar' hook pads coated with adhesive activated by ultrasonic or hot air heating, that could be fixed to mats to make them 'Engage' to carpets and their 'Klettoplast' arrowhead equipped adhesive backed strip, that engages even more strongly. European customers include BMW.

Lohmann Tapes has a hook and loop tape combination, with adhesive on one side that is

only 0.5mm thick that is currently used for closures on medical products and trim within cars. The company also has a new pure acrylic adhesive strip, designated CPT 500F, that is optically clear, and can be stretched by a couple of hundred percent, returning to its former length when released. Developed for glazing to allow movement, it is used in the automotive industries. The company has also developed an acrylic adhesive tape that is particularly sticky, or as it puts it 'aggressive', with an adherence sufficient to allow it to be used to repair bouncy castles and HGV semi-trailer side curtains, and also non-slip, ribbed, adhesive pads for uses ranging from toothbrush grips to office furniture.

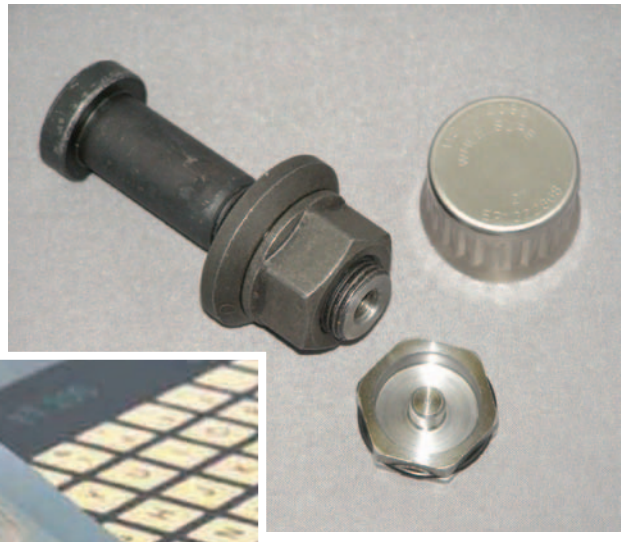


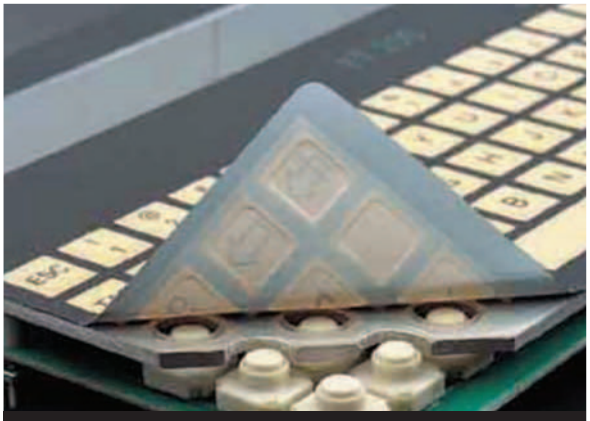
Alfatex also makes hook and loop tapes at its factory in Belgium, and sales director Alan Rogers claims that it can produce products that are anti-microbial for medical use, and products that are anti-static.

For permanent metal-to-metal bonding, Tox Pressotechnik's clinching technology allows thin sheets of metal to be joined by pressing a punch into metal, with a die on the reverse side that allows the formed cup to expand sideways. Advantages over spot welding are the lack of weakened, heat affected zones, and the ability to fasten different metals together, such as steel and aluminium. BTM (UK) Automation Products has what appears to be very similar technology, although managing director Mark Firmin says: "What sets us apart is our use of an expanding die, which requires less force to form the clinch, resulting in longer tool life." Böllhoff, on the other hand extols the virtues of its Rivtac system, in which fastening is achieved by forcing in 'tacks', which have the advantage that they only require access from one side.

Various companies, notably Henrob, offer versions of technologies based on self piercing rivets (pictured, left). Henrob offers rivets with standoff pins and studs in addition to plain tops while other companies offer heads with nuts and even ball joints.

Arnold Umformtechnik have 'Tripress' (ATP) fasteners with a trilobular cross section that when pressed into a round hole in ductile light metals and plastics, deform the hole and lock the fastener in place. The combination of shapes used minimises pressing force, while maximising the force required to dislodge it, usually increasing it beyond the yield stress of conventional fastener. The first part of the fastener to be pressed into the hole is designed to prevent it rotating, while the second part has a set of tapered circumferential ridges to prevent it being pulled out. The system is said to be particularly suited for securing electric terminal studs in motor vehicles.





Above: Lohmann acrylic adhesive tape
Above right: The Wheelsure nut

The same company has recently announced Remform screws for fastening detachable plastic parts. Although, at first sight, they look like conventional self tapping screws, they have threads with asymmetric flanks to optimise material flow and to increase pull out force. They have recently been employed in the assembly of a two piece washing machine outer drum. Requirements included maintaining the residual clamp force for the lifetime of the washing machine, vibration resistance, an operating range of -10 to 65ºC and an assembly time of less than 1s per screw.

www.wheelsure.co.uk
www.loctite.co.uk
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Design Pointers

- British designed anti-vibration bolts and studs that combine left and right handed threads on the same thread are finding service on Dutch railways and British trucks
- A wide range of captive fasteners has been developed to meet the needs of the new Machinery Directive which requires their use in guarding systems
- There are new ranges of hook and loop fastening systems and adhesives tapes as well as metal clinching systems and improved push in fasteners. Threadlocking compounds continue to be improved

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Clever designs make complex parts

Tom Shelley reports on how surprisingly complex parts can be made using conventional plastic manufacturing methods.

By clever use of traditional methods, it is possible to make very complex plastic shapes without having to resort to additive 3D printing methods.

Applications range from lightweight double walled pipes and containers up to 3.5m in diameter that are made by a combination of extrusion, welding and forming, to devices that can be inserted into the human body and change their shape when they come into contact with body fluids.

The large pipes, as well as derived joints and containers, are made by Asset International in Newport, South Wales. Managing director Simon Thomas explains that these use Finnish invented technology 'Weholite' to extrude a hollow box section profile in high-density polyethylene (HDPE). This is wound onto a mandrel and the coils continuously welded together using a patented process. Internal diameters range from 0.4m to 3.5m and lengths from 1m to more than 14m. The idea achieves considerable cost and transport weight savings relative to solid walled pipes and vessels.

The shape-changing plastic devices, although not an entirely new idea, have been developed with a very practical goal in mind, that is to use a pill of hydroactive polymer to make a forceps close at the end of a catheter on contact with moisture. The device is intended to be used in non-invasive medical procedures. A prototype has been developed at Madrid Polytechnic University as part of a Spanish project, IBE-RM, under the leadership of the Toy Research Institute – AIJU. Suny Martinez, from the Product Development Laboratory Department at AIJU said: "Our contribution to the project consists of studying materials with smart functionalities already available in the market and adapting them according to the requirements of the rapid manufacturing technologies with which the consortium works."

Much can be done with injection moulding on its own, using innovative ways of putting plastic parts together. Particularly striking is the design of chip

Making good use of recycled plastics

Tom Shelley reports on the latest views on using recycled plastics in engineered products.

Making products and components out of polymers that are partly or wholly recycled is becoming a more and more commercially attractive option now that prices of virgin plastics continue to move upwards with the price of oil and recycling itself becomes more commonplace.

However, some plastics recycle better than others, properties depend on grade, history, and possible contamination, and while some recycled plastics are getting into engineered products, they are not normally considered appropriate for critical applications requiring high mechanical performance.

Alastair Green, in charge of research and development at AK Industries in Hereford, believes using recycled plastic in a design 'should certainly come out cheaper', adding that there is 'not a huge amount of difference' between the properties of virgin and recycled materials. He does point out, however, that 'you normally cannot run 100% recycled'.

How easy it is to use recycled polymer depends on what the polymer is. Green says some, including polypropylene (PP), polystyrene (PS) and unfilled polyacetals (otherwise known as polyoxymethylene or POM), are relatively easy to use. He also points out that there is "close to 100%" of recycled PET (polyethylene terephthalate) in plastic bottles. However, he notes there are problems with some engineering polymers, especially when they contain fillers.

At present, Green says his company is not producing many products made with recycled plastic due to customer and product requirements. The exception is a device called the 'Warmit', which uses waste water from domestic showers to warm incoming cold water. The heat exchanger for this, which was developed with Pera, is made from recycled Acrylonitrile Butadiene Styrene (ABS). It will

resistant, totally enclosed chains for cables and services for manufacturing, made by igus. This RX40 E-Tube has pivot joints on the insides of the links and its rounded outer surfaces prevent chip accumulation. The lids are totally enclosed, yet easy to open, thanks to a cam mechanism with a slotted head that can be accessed from the outside of the chain. Tests in a barrel full of swarf resulted in only 0.2g of metal chips getting inside the chain after 80,000 cycles.

Rather less forthcoming about how such parts are manufactured is the German company Hewitech, which makes intricate, 3D structured fills for catching dust and droplets in airflows and detritus in drainage, as well as structures to assist water evaporation in coolers and cooling towers. Some are clearly made by injection moulding and sheet extrusion, with layers subsequently welded together. Materials are polypropylene, HDPE and fluoropolymers, which allow working at up to 260ºC and resist ultraviolet light and possible build up of biofilms.

It has been suggested that such structures could form the basis of advanced engineering constructions of extremely high mechanical stiffness per unit weight. Most people who have tried to make them for that purpose have resorted to additive manufacturing processes, which originally started as a way of making rapid prototypes, but which have increasingly become used for short-run manufacturing.

One of the latest such machines is the HP Designjet 3D printer, which is available in two models, starting at less than €13,000. The HP DesignJet 3D produces models in ABS, while the HP Designjet Color 3D can produce single colour parts using eight different colours. Support material is water soluble and removed automatically. The machines arise from a partnership with Stratasys, whose base technology is fused deposition modelling.

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eventually go on the commercial market after it has been approved by WRAS – the Water Regulations Advisory Scheme. Green claims that, as regards designing products to make use of recycled plastic, there little that designers had to worry about. A bigger issue in his opinion, was designing products made of plastic in such a way that the plastic parts could more easily be recovered for recycling.

A company whose products are based on 100% recycled polymers is Trojan Services in Chichester, which makes cable troughs – including designs that can be walked on and driven over – for the UK rail and other industries. Managing director Stewart Wellens says that its 'TroTrof' and 'TroTred' products are made from 'post-industrial polyolefins'. Unlike traditional concrete products, the tops can be screwed down to resist vandals and cable thieves and the TrofTrof units can withstand loads of 25 tonnes and the TroTred units (pictured, left), 6 tonnes, without suffering damage. Off cuts resulting during installation are recycled back to production.

Ford also uses recycled plastics but only in certain components. Post-consumer recycled polymers are used by them to make underbody parts such as aerodynamic shields, splash shields and radiator air deflector shields. In the US, the latest example is the engine cam cover on the 3 litre V6 2010 Ford Escape. Repurposed nylon carpeting made into nylon mesh is moulded into cylinder head covers for the Ford 3 litre 'Duratec' engine, as used in to 2010 Ford Fusion and Escape. In Europe, the Ford Focus uses recycled polymer in the battery tray and wheel arch liners. Materials engineers are in the process of determining whether recycled polymer can be used for similar components in the global Ford Focus coming to North America and Europe in 2011. "Sustainable materials need to meet the same high standards for quality, durability and performance as virgin material; there can be no compromise on product quality," said Valentina Cerato, Ford materials engineer in Europe.

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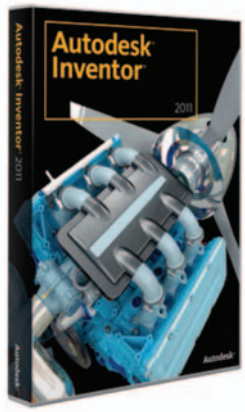
Autodesk goes upmarket



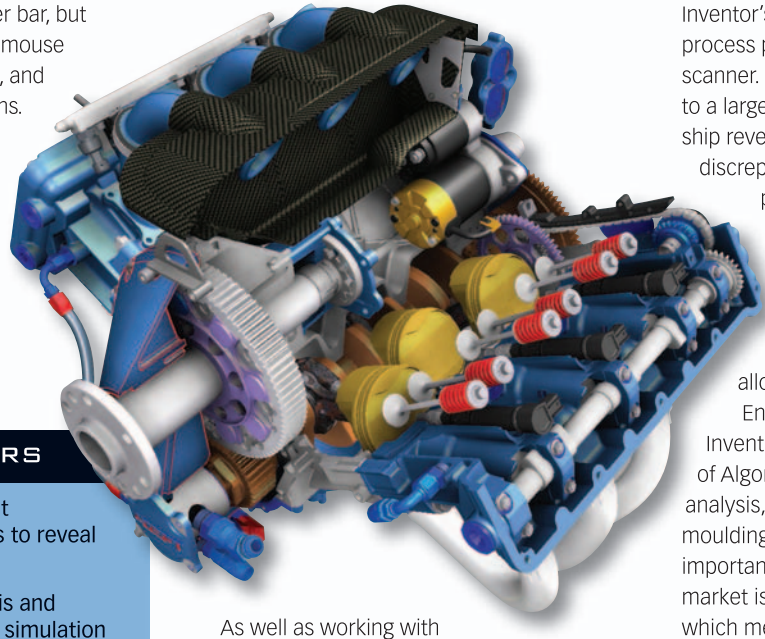
Tom Shelley reports on how Autodesk's latest offerings make its products comparable with top-end CAD software.

Autodesk now sees itself as being able to compete directly with the likes of PTC, Siemens PLM and Dassault's CATIA, thanks to a combination of in-house developments to Inventor and the integration of some acquired products.

Coming from one of the acquisitions, Alias Design for Inventor 2011 gives users freeform shape and parametric modeling within the Inventor environment.

The whole Inventor interface is different, in that there is now no need to find buttons on a ribbon bar and menus and power bar, but commands are initiated by right mouse clicking near features of interest, and choosing between offered options. Users who miss the traditional menu structure can still call it up if they want to but it is likely that few will want to do so once they get used to the new approach.

Also new is Autodesk Sketchbook for Apple's iPad. Autodesk has been trying to persuade people for at least a decade that the way forward for 'fag packet' sketching is to do this on a mobile phone or PDA, but the idea never really took off when screens were too small for engineers to insert important details. But an iPad has quite a reasonable size screen and, with a download price of only £90 for the full Pro version, sketches can be done in the field, captured and sent where they are needed.



As well as working with right mouse clicks without toolbars, it is also possible to design without a feature tree and push- and pull-on geometry using what Autodesk calls its 'Fusion Technology', working in a similar manner to Siemens PLM's 'Synchronous Technology' and SolidWork's 'Direct editing', although each vendor insists its technology is different from that offered by their competitors. New in Inventor 2011 is the ability to open Catia V4, as well as V5, files and implement 'iCopy', which is a copy and paste facility 'with steroids' that resizes the copied object each time it is pasted so that it is re-sized to fit within a design by referencing key points. Another useful facility, 'iLogic' enables so-called 'if-then-else' statements to be used to configure multiple variants of a design. Parker has apparently used this function to design a control valve with 2,500 possible versions.

Colin Couper, development manager, marine division – integrated technology for Babcock International, offered a demonstration of Inventor's ability to handle point clouds of process plant captured using a Leica HDS 6000 scanner. He showed how applying the technique to a large pipe layer tensioner on the side of a ship revealed that there was a 28.42mm discrepancy between the design files and physical hardware that was to be modified. He also declared himself impressed by the speed with which NavisWorks, also acquired by Autodesk, can open very large AutoCAD shipbuilding design files to allow them to be viewed and navigated.

Engineering analysis and simulation in Inventor 2011 is enhanced by the integration of Algor for FEA, CFD and other types of analysis, and with Moldflow for plastic moulding simulation. Of perhaps even more importance in helping to speed products to market is the inception of Autodesk Publisher, which means that preparation of manuals can start before design work is complete. This is because drawings in Publisher can be associated with models in AutoCAD and Inventor and updated automatically when design changes are made.

Cloud computing versions of Autodesk products are currently in trial and it is said that the customers most interested in browser based cloud computing design are those that perform large amounts of FEA and CFD analysis.

www.autodesk.co.uk

Design Pointers

- Toolbars are out and right mouse clicks near features to reveal modelling options are in
- Algor engineering analysis and Moldflow plastic moulding simulation tools are now available integrated in Inventor
- New facilities that can save much time include iCopy and iLogic
- Autodesk Publisher drawings can be associated with Inventor models so that design manuals can be begun before a design is finalised, with model updates automatically reflected in diagrams for manuals

Software takes the virtual track to safety

Tom Shelley reports on how real world filming enhances virtual reality design for railways.

Virtual reality technology developed for use in Hollywood Films is being used to design railway signalling systems. The idea, which allows drivers to see track and signals clearly and unambiguously, could equally well be applied to improving design in truly realistic driving, operating and maintenance scenarios.

The breakthrough achieved by Kent company Gioconda is the total integration of high-definition video and CAD modelling to allow virtual reality design to be undertaken in a real world simulation in real time.

The development started when Network Rail asked Giaconda to come up with a virtual reality way of assessing sites for signals that did not require site visits by signal sighting committees. Not only do these take up a lot of time, but they are also associated with a certain amount of hazard, because trains are not stopped to allow them to take place.

The footage is annotated and used to survey and plan asset recovery and installation. Tools developed by Giaconda allow 3D CAD models of signals to be imposed on video sequences, and their dimensions, orientation and type of beams amended to ensure maximum visibility and to prevent confusion between signals relating to different parallel sections of track. Positions are directly related to CAD drawings of track layouts, which are precisely related to the video sequences. 3D OLE and other structures can be placed on the video footage to assess the effect of obstructions. Existing signals that are to be removed can be blurred out, but not deleted. Alternatively, track, signals and everything else can be created from scratch in a virtual world. Having completed the signalling design, the new virtual railway can be used for driver training and route familiarisation.

Design Pointers

- Real world high definition video is linked to CAD drawings of layouts
- 3D CAD models can be inserted in the video sequences and then modified parametrically within the realistic virtual environment
- This allows the design and visibility testing of railway signals in the environment in which they are to be used, without requiring site visits with their attendant costs and hazards
- The technology has the potential to be applied to various other industries, especially automotive, aerospace, offshore oil and gas and nuclear.

As well as railways, there are many other instances where this kind of approach could be useful. Virtual reality is widely used to assess car and aircraft cockpit design and maintenance scenarios for everything from engines to nuclear reactors. It would be most useful to integrate real world video into some of the processes to improve realism, especially modification of CAD designs within a realistic environment. The only problem is that the real world camera can only move along certain paths, but this should not be too serious a limitation when applied to aircraft landing, driving and plunging into machinery along predetermined paths for maintenance.

To allow for deviations, it is possible to shoot the video at a wider angle than that viewed on the screen at any one time so the user can move sideways within the captured scenes. Such techniques are already used in gaming, which has for some time been at the leading edge when it comes to realistic simulation.

www.gioconda.co.uk

Built-in batteries to transform design

Research into integrating batteries within materials could make hybrid vehicles much lighter. Graham Pitcher reports.

Batteries in large scale applications are often heavy and require the product to be designed around them. What if you could integrate the battery into the product itself? That question is being addressed by a research team at Imperial College.

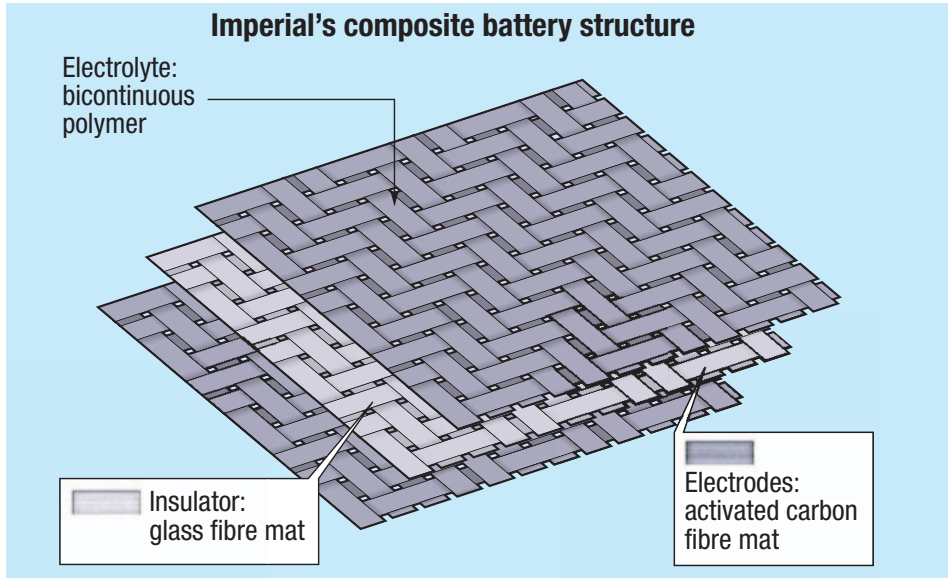
The €3.4million project, which also involves Volvo, is developing a prototype material that can store and discharge electrical energy, but which is light and strong enough to be used for car parts.

The researchers say that the composite material they are developing, which is made of carbon fibres and a polymer resin, will store and discharge large amounts of energy much more quickly than conventional batteries. In addition, the material does not use chemical processes, making it quicker to recharge than conventional batteries. And the researchers say this recharging process causes little degradation in the composite material, because it does not involve a chemical reaction, whereas conventional batteries degrade over time.

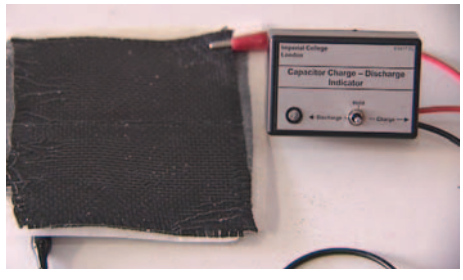
One of the researchers is Anthony Kucernak, professor of physical chemistry in Imperial's Department of Chemistry. He said: "Today, you have to build products around batteries. Our idea is to develop materials which can replace a structural component, but which can also store power. In an ideal world, these would have the mechanical properties of the material being replaced, along with the electrical properties of a lithium ion battery."

There are two potential applications: battery and supercapacitor. In the latter approach, energy can be stored for use when needed.

Prof Kucernak pointed out that the battery approach requires an electrolyte to be included within the carbon fibre. "We build the battery using an electrolyte," he noted, "but need to modify how we deposit that chemistry on the fibres so that it is integral to the structure. In theory, we could create a device which is smaller and weighs less for a given amount of energy storage. We have demonstrated that the approach works for supercapacitors."



Initially, 7µm carbon fibres were used, but Prof Kucernak said these didn't work very well as capacitors because of their low surface area. "We're now growing carbon nanofibres on their surface, effectively creating 'hairy fibres'. So far, we have achieved a specific capacitance of 14Farad/g and the material maintains good structural performance."



A sample of Imperial's composite storage material undergoing tests

A further avenue of research is hybrid structures – half battery, half supercapacitor. Prof Kucernak said: "This will allow the benefits of both; the energy capacity of batteries and the high charge/discharge rates of supercapacitors."

The researchers believe the composite material could be used to make hybrid vehicles considerably lighter. The research team, in conjunction with Volvo, is planning to develop the composite material so that it can be used to replace the metal flooring of a car's wheel well. This would reduce the number of batteries needed to power the hybrid's electric motor and could reduce vehicle weight by 15%.

In addition, the material could potentially be used for the casings of devices such as mobile phones and computers, but the project is targeting large scale applications. "One area is cars," Prof Kucernak explained, "another is planes; both areas where combining mechanical and electrical performance will be better than having a separate battery."

www.imperial.ac.uk

READER INTERVIEW

IAN PARROT
PROJECT DESIGN ENGINEER
SENIOR AEROSPACE BWT

A world leader in ultra-lightweight, low-pressure air distribution and insulation systems, Senior Aerospace BWT (formerly Baxter Woodhouse Taylor) is part of Senior plc – a group of international manufacturing companies with operations in 11 countries manufacturing and marketing components and systems for principal OEMs in the worldwide aerospace, automotive and specialised industrial markets. Senior Aerospace BWT's system solutions, both modular and aircraft specific, optimise weight, cost, pressure loss, installation time and efficient use of the available space envelope.

Q How did you first get into the engineering industry?

A I just answered an advert in the local paper. Aerospace had always interested me. Engineering in general had always been interesting for me, but aerospace in particular was the thing that fascinated me.

Q What does your role with Senior Aerospace BWT involve on a day-to-day basis?

A The title's project design engineer and we do air conditioning ducting, so it mostly revolves around designing air conditioning systems for aircraft.

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

A The AW101 medium-lift helicopter for Westland and the Merlin CSP (Capability Sustainment Plus) helicopter.

Q What are the most interesting projects or pieces of engineering that you've been involved in?

A Working on a job for NASA on the space shuttle. It was a ground support silencer system for when we were doing ground servicing. Another interesting project we were working on was the air conditioning systems for the VH-71 Kestrel Presidential Helicopter, until funding for that was eventually cancelled. I worked on Concorde as well. We did the fuselage insulation of the entire Concorde fleet for British Airways. The paperwork side of those things and the standards you had to work to for projects like that really set them apart.

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

A I think there's far more controls and paperwork than there used to be. Things like the ISO standards are a bit of a constriction in terms of how you can work and they don't allow you to react as quickly as you used to be able to do in the old days. You've got to get the job done, but sometimes it feels like you've got your hands tied behind your back a bit more than used to be the case. There was a bit more freedom back then.

Q What are the big issues facing your industry these days?

A Well I suppose first and foremost it's probably the recession. It's hit the airline industry pretty hard. Although the helicopter market's quite buoyant – at least Westland is and we do quite a lot of work for them, so that's good. Orders generally are starting to pick up again, but it tends to come in cycles, really. Things will tend to go up and down. The paperwork side also tends to get more rigorous and it's getting harder and harder to recruit the right people as well.

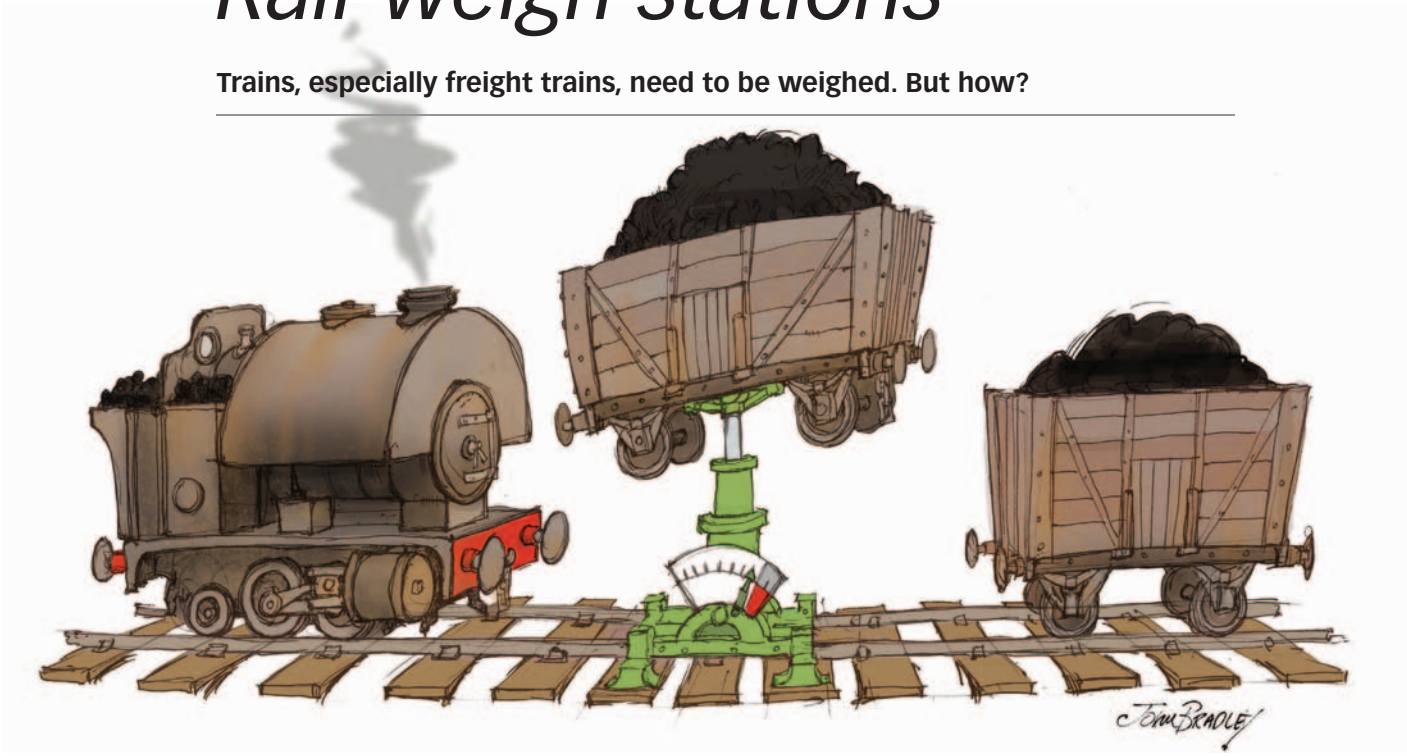
Q What still excites you about engineering?

A Coming up with something new that's going to work. At the end of the day, that's the big driving factor behind engineering isn't it? When all the bean counters aren't trying to restrict everything, of course, which is normally the case. Mind you, I shouldn't say that, really, as the wife's a bean-counter!

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

Rail-weigh stations

Trains, especially freight trains, need to be weighed. But how?



Just as overloaded heavy goods vehicles can damage roads, trains or railway wagons that are too heavy can damage rails. Worse than that, they can result in track subsidence and trains coming off rails. There have, in addition, been train crashes recorded in the US as a consequence of trains that have been too heavy for their braking power descending a long downhill gradient. Such happenings result in a fearsome amount of expenditure to put right, assuming that there have been no human deaths or injuries. And if wagons contains bulk materials – stone, sand, coal, gypsum or grain, it is necessary to know how much they carry in order to assess the value of their cargo in the interests of commerce, or to know how much to charge for carrying them.

There is also the issue of whether wagons are loaded evenly. On a heavy goods vehicle on a road, it is usually fairly easy to see if a load is lop sided, since springs will be visibly more depressed where the weight is greatest, but the same is not true of a railway wagon. Nonetheless, a badly distributed load is equally problematic, potentially resulting in excessive stress to wheel profiles, axle boxes, bearings, gear boxes, final drive units and suspension components. The problems are much the same, regardless of whether the train is going on the national rail network, or is purely being used to move heavy items or minerals on a privately owned network in a steelworks, power station or mining or quarrying operation.

The Challenge

It is possible to build a weighbridge for rail wagons, in the same way that it is possible to build a weighbridge for trucks, but these are large items, expensive, and take some time to install.

If a potential problem with a possibly overweight train or badly loaded wagon is suspected, there may not be a weighbridge in the vicinity to make measurements before launching the train into the railway system. Hence, as well as a weighbridge, there needs to be some way to weigh wagons, wholly or by axle, or whole trains, using some simple system that can either be quickly installed or is portable.

Scales suitable for weighing a whole train are clearly impractical, but a specialist British company has come up with systems that allow wagons and trains to be weighed using units that are relatively simple to install. It has even developed a package that can be transported in the back of a car, carried to where it is needed by two men, and installed in 15 minutes. It does make use of modern technology to give and record accurate results, but its basis is extremely simple. Victorian engineers could have developed it too, if any of them had thought of it.

The solution will be described fully in Eureka's July 2010 edition. See if you can come up with anything better.

The answer to last month's Coffee Time Challenge of how to design a wave-powered boat can be found in our Technology briefs section on page 10

Adhesives

Don't Tamper With Loctite!

Detecting whether equipment or a component has been tampered with has been made easy.

Loctite 7414 Torque Marque is a blue, fast drying, high viscose paste developed for use on compression fittings, studs, nuts, parts and assemblies after they have been set to proper tension or position.

Once fully cured, the product fractures if the components are moved, allowing service personnel to quickly spot any tampering that might invalidate a warranty claim. It adheres readily to metals, including aluminium, magnesium, titanium, stainless steel and copper, and has an operating temperature range of -35°C to +145°C.

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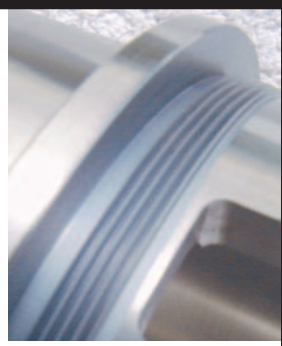
Coatings

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!

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Disc Springs

New Spirol Stainless Steel Disc Springs

Spirol Industries has expanded its range of Disc Springs with the addition of new stainless steel versions. Although stainless steel is not part of the DIN 2093 standard, all the disc springs produced by Spirol are controlled to that exacting level. Two types of stainless steel Disc Springs are now available. The new austenitic stainless steel version, X10CrNi18-8 (1.4310), is ideal for low cycle applications and is available as a standard product. For high cycle applications, Spirol now also offers to special customer order the precipitation hardened X7CrNiAl17-7 (1.4568) Disc Spring. Both have excellent corrosion resistance. Disc Springs are conically-shaped, washer-type components designed to be axially loaded. They can be continuously or intermittently statically loaded as well as dynamically subjected to continuous load cycling. They can be used singularly or in multiples - stacked parallel, in series or in combination.

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Drives

ABB drives save £100,000 per year energy costs for Severn Trent Water

Severn Trent Water (STW) is saving around £100,000 per year on energy costs thanks to the installation of ABB variable speed drives at its Wanlip Sewage Treatment Works.

STW was suffering low flow rates on its dry well flow pumps. Sentridge Control, a member of the ABB Drives Alliance was asked to provide a solution. Sentridge suspected the problem was due to ragging of the pumps.

To solve the problem, Sentridge suggested installing 75kW ABB industrial drives on all the pumps, each equipped with ABB Anti-Jam software, part of its Intelligent Pump Control (IPC) software.

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Electric Atomisers

Fine Droplets without High Pressure

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

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

Applications include:

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Flowmeters

Titan's Breakthrough in Small Bore Flow Metering

Titan Enterprises breakthrough product is now available from £464 EXC VAT!

The new 'Atrato' is a direct and accurate through meter without a contorted flow path which can operate over very wide flow ranges. The ultrasonic technology used offers excellent turndown, linearity and repeatability.

The Atrato is capable of monitoring flow over a range of 200:1 and has accuracy better than ±1.5%. Its simple, yet effective design makes it applicable to a variety of markets, whilst its USB interface makes it extremely easy to install and use.

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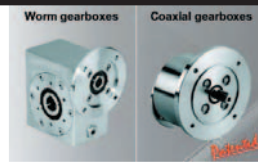
Gearboxes

Davall Stock Gears introduce smooth, full stainless steel housing gearboxes



Specifically designed for the harshest of environmental applications. The gearboxes are ideally suited for food or drink preparation sites, and "clean room" production facilities. Both ranges are constructed with a stainless steel housing (304), and designed to be close coupled to a B14 face mounting stainless steel AC motor accepting either IEC (European) or NEMA (America) frame motors, and are available dimensioned in either metric or inch. These STAINLESS STEEL HOUSING gearboxes are available in two gear geometries, either in-line helical reduction (co-axial) or worm & wormwheel reduction (right angle). The gearboxes are designed to ensure a minimum maintenance regime can be adopted. All steel gears are hardened and ground, and supported using high quality bearings. The worm unit has 2 bearings on the worm line, 2 bearings on the wheel (output) line, to ensure maximum power transmission capacity.

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Imaging

High Dynamic Range Cameras Based On Solar Cell Technology

A new range of cameras from STEMMER IMAGING use a sensor based on solar cell technology to allow imaging from scenes which simultaneously contain both very light and very dark areas. This makes them ideally suited to use in environments with a very high dynamic range, or where there are strong and unpredictable brightness fluctuations. The new FX4 HDR (High Dynamic Range) sensor from IDS produces a logarithmic signal output. This enables fine differences in brightness to be imaged even in very bright scenes, without saturation, in a similar way to the human eye. Most of the USB and all of the GigE versions (HE, RE and SE) of the IDS uEye family of industrial cameras feature an FX4 HDR sensor version.

The FX4 HDR sensor features a patented pixel structure that provides a truly logarithmic output with effective suppression of fixed noise and gives a dynamic range of 120 db.

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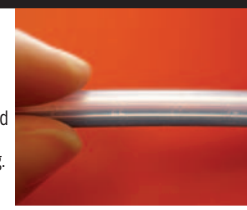
Laser Marking

Laser Marking Silicone Tubing Using Synrad Lasers



Silicone tubing is widely used in the pharmaceutical and biotechnology industries where ultra-pure fluid transfer is essential for health and safety. In addition to its flexibility and puncture-resistance, silicone tubing is free of additives that could leach into, or contaminate, fluids carried by the tubing. This application demonstrates the feasibility of marking silicone tubing using Synrad Lasers available from Laser Lines Ltd. Using Synrad's WinMark Pro, a mark file was created containing 15 sets of two-digit numeric characters laid diagonally across the mark field of a Synrad FH Series 200 mm lens. Using 25 watts of Power at a Velocity of 508 mm per second (20 inches/sec), a string of 30 characters were marked in total in a cycle time of 0.68 seconds per string. Laser Lines offers the complete range of Synrad lasers including the WinMark Pro laser marking software.

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Pressure Measurement

PVL corrosion-resistant, 'all-plastic' level and flow switches

Over 30 years experience in the measurement & control of Pressure, Vacuum & Gas flow gives Chell unsurpassed knowledge in industry & science. Solutions to many measurement problems have been provided in applications as diverse as breweries and space exploration.

Many industries have benefited from Chell's ability to fully engineer complete instrumentation systems tailored to the application. An example of this is our range of Leak Rate Monitors, manufactured in our own factory, which have become an industry standard for Power Generation on both sides of the Atlantic.

@: info@chell.co.uk
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www.chell-instruments.co.uk

Pressure Transmitters

A-10 goes outdoor

The compact A-10 pressure transmitter from WIKA is now ready for use outside. It lives up to its promises: in winter at temperatures down to -30 °C and also in summer with the greatest of heats.

The A-10 has long been recognised for its excellent quality and its economical pricing. It has been designed for general industrial applications and versatility.

With the option now available for operation over an extended temperature range of -30 ... +100 °C, the application range for the A-10 has once again been considerably expanded.

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RP Support

Smart Supports Save Time and Material

Stratasys have developed a new support strategy that will enhance the performance of all their current 3D Printing and Rapid Prototyping systems. The new option, called Smart Supports, progressively reduces the area of the support column to create a structure like an inverted pyramid. This structure uses less material but still provides the support needed to maintain the high accuracy and build quality associated with FDM models. In some cases the volume of support material required can be reduced by 40% and as less material is extruded there is also a considerable saving in build time. The pictures show a wheel with both the Sparse and Smart support clearly illustrating the reduced volume of support material required. Smart Support is a software option so many FDM users will be able to benefit from this enhancement simply by upgrading to the latest version of Catalyst or Insight.

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Sensors/Switches

Pressure level temperature and flow

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

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

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

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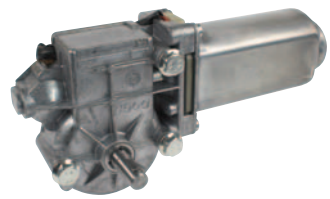
Space Saving Motors

Space saving flat geared motor



The new 317-series flat bodied, low profile, geared motor from Doga, is ideally suited to applications where weight and space are at a premium and there is a requirement for low speeds with high torque from a compact unit. The motor is available in both 12V & 24V dc providing 4Nm nominal torque at 25rpm and a stall torque of 12Nm.

For machine builders, Doga will study specific application needs and propose customised versions on request.

@: information@uk.oem.se
✆: 0116 2849900 OEM Automatic Ltd

www.oem.co.uk

Switches

PVL launches corrosion-resistant, 'all-plastic' level and flow switches

EW to the UK and EUROPE, and exclusively available from Pressure Vacuum Level is a comprehensive and unique range of 'all-plastic' level and flow switches. Manufactured in either PVC or ABS plastic, and designed for controlling the level or flow of corrosive acids, alkaline fluids, sea water, or wherever a chemically inert switch is essential, the Kelco range includes in-line flow switches, paddle flow switches and level switches suitable for various pipe sizes and flow rates. These innovative products, which are manufactured in Australia, are currently being used extensively throughout the world in the chemical and water treatment industries.

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The New Investment

Spirax Sarco invests £25 million in UK manufacturing

Spirax Sarco is investing close to £25 million to consolidate and modernise its manufacturing facilities in Cheltenham. The project will improve customer service, reduce order lead-times and ensure that the manufacturing operations are more environmentally-friendly. The 'Unity Project' will bring Spirax Sarco's existing manufacturing and R&D operations at three sites around Cheltenham onto one site at Runnings Road. Spirax Sarco has acquired a five-acre site across the road from its existing factory to provide the space for the consolidation. A tunnel will be built underneath the road to enable goods to be transferred between plants without disrupting local traffic and ensuring the highest levels of health and safety. As well as revamping the layout at the existing site, a new finished-goods warehouse and central boiler house will be built.

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Transmitters

VEGA launch new DP transmitter.

The VEGADIF 65 has ranges from 10mBar to 40 Bar, accuracy 0.075 %, temperatures -40 ... +400 °C, static pressures up to 420 bar. As a plics® instrument it features an IP 68 version with remote electronics, housings of plastic, aluminium and stainless steel in single or double chamber format. Outputs are 4 ... 20 mA/HART, Profibus PA and FF. Backlit adjustment/ indication is via the plug-in PLICSCOM. Compatibility to PACTware, PDM, AMS or HART Field Communicators, allow setup with a PC. Competitive pricing completes the comprehensive offering

@: info@uk.vega.com
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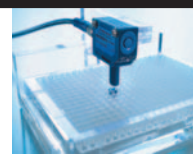
www.vegacontrols.co.uk

Ultrasonic Sensors

Ultrasonic sensor used in Medical Analysis



Balluff introduce Microsonic's ultrasonic sensor with SoundPipe, which can measure levels in microplate wells used in medical analysis technology. The new SoundPipe can be used with each and every zws-15 sensor. It directs sound to the measuring point and thus measurements can be taken in drill holes and openings with diameters under 3 mm. Since the zws-15 sensor blind zone is inside the SoundPipe, measurements can be taken directly from the sound outlet opening. The result is a tightly bundled sound field brought directly to the measuring point. A typical field of application is measuring levels in microplate wells which are used in medical analysis technology. The SoundPipe can be directly positioned over the opening; this makes an exact measurement possible. The attachment can also be used in scanning gaps of only a few millimetres in width between two objects. For more information on the Microsonic range of sensors visit the Balluff website www.balluff.co.uk or contact our sales team on 0161 282 4700.

@: sales@balluff.co.uk
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www.balluff.co.uk

Linear Motion

Keeping it simple

With the launch of Red Drive, Rotalink has driven down the development costs of smallscale DC motor control systems and significantly simplified motion control programming.

Smaller than a credit card, Rotalink's Red Drive DC motor controller - with motor, gearbox and encoder – requires no complex programming to control all the variables associated with rotational or linear movement. Its simple Windows-based drag-and-drop flowchart style interface uses real world values such as seconds, revolutions and gearbox output rpm to control speed, acceleration, position, dwell etc., and to manage digital I/O connections for interaction with limit switches, sensors, LEDs, relays and similar signals.

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Linear Motion

Only the best is good enough for linear engineering

Matara's primary objective is offering UK machine builders and OEMs technically superior yet cost effective linear automation components. It has scoured the world to find the best global partners and built up its own production facility and reputation for technical support.

Amongst their exclusive distribution agreements are PMI-AMT, one of the largest manufacturers of ballscrews and linear rail systems in the world. PMI supply over 30% of the Japanese machine tool industry and more than all other suppliers put together in Taiwan.

The Matara service philosophy is simple – they never turn a customer away. If it's in stock or can be manufactured, the customer can have it.

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www.matara.com

cube67+ – THE PLUS FOR ADDED FLEXIBILITY

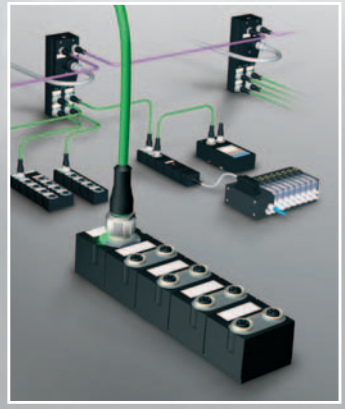
The next generation

The innovative multi-protocol fieldbus system from Murrelektronik, which has radically simplified and modernized decentralized installation has taken a step further with a plus.

The single bus node can support up to 20 I/O modules in a 30m circumference and with a reduced number of cables. The range of I/O modules continues to grow and includes digital and analogue ports, safe outputs, logic, counter, valve island, temperature, I/O link etc. Both IP67 or IP20 are available.

Cube67+ : a truly flexible system.

- **More options**
- **More flexibility**
- **More distance**
- **More performance**



Cube67 – the modular bus system

PROFINET · PROFIBUS · CANopen · EtherNet/IP · DeviceNet

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