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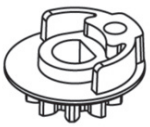

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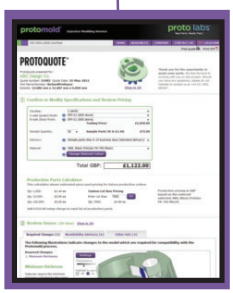

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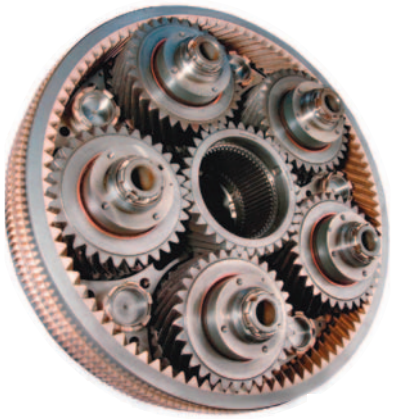

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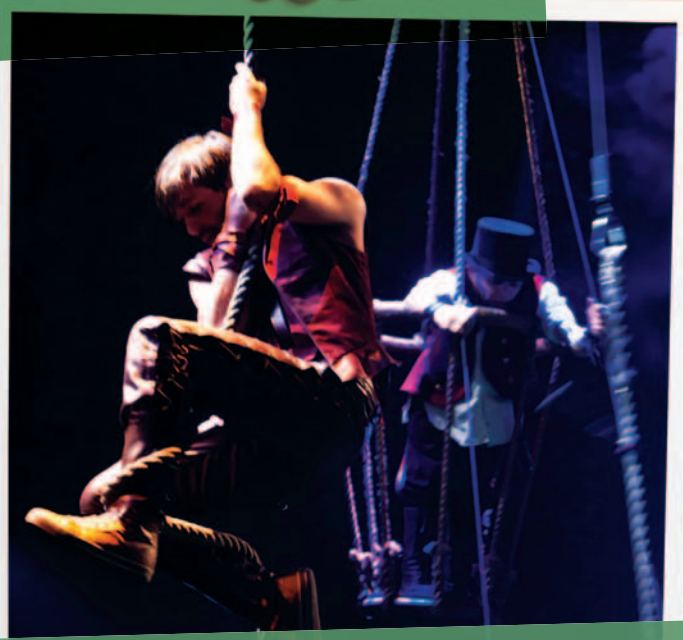
“Control Techniques helped improve our performance”



Gill Stephenson
Senior Automation Engineer,
Royal Shakespeare Company

Gill Stephenson is rightly proud of the newly renovated Royal Shakespeare Theatre in Stratford-upon-Avon.

“With around 100 AC drives and servo motors controlling backdrops, scenery and lighting, we’re creating effects achievable only with the cutting edge electronics offered by Control Techniques.”

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Is the message getting through?

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

The fact that the House of Lords Science and Technology Committee has come to the conclusion that universities are not producing enough science and engineering graduates with the skills needed by UK industry is clearly to be welcomed. Any official recognition of the severity of this problem that brings it to greater prominence (and thereby causes it to be addressed) can only be a good thing.

Even so, it is hard to believe that it could have taken the Committee until now to arrive at this conclusion, particularly as industry has been crying out for action on this problem for years. One's reaction to the news that the Committee's chairman Lord Willis declared himself "gobsmacked" by the results is to ask how this could come as a surprise? After all, anyone who has been talking to those in engineering in recent years has been hearing a fairly constant stream of complaints about the shortage of properly skilled recruits.

Even so, one must acknowledge that Lord Willis' bald statement that "the quality of the STEM graduates coming out of universities does not meet the requirements of industry" has attracted a degree of welcome media attention. It has served to put this urgent problem at the the top of the news agenda in a way that any number of business leaders raising the same issue has failed to do has not. And, if the Committee's report brings positive action, then we must all be grateful.

What is worrying, though, is that it has seemingly taken this report to draw the UK's attention to this problem. This is because it suggests that the voices of industry and engineering are still not being heard as they should be by government and media, with their messages only filtering through once endorsed by a politician. If the necessary urgent action is to be taken, this situation needs to change.

Conference programme attracts big names

The Engineering Design Show Conference is nearly complete, with some of the UK's leading names in design and engineering set to take part.

Running alongside the Engineering Design Show at the Ricoh Arena, Coventry on 10th and 11th October, the Conference offers delegates an opportunity to hear about the latest technologies, techniques and strategies employed by experts at the forefront of their fields.

Currently, those signed up to address the Conference include representatives from some of the UK's most illustrious names, including **BAE Systems**, **McLaren**, **AgustaWestland** and **Red Bull Racing**.

Speakers confirmed so far include:

• James Baker, Managing Director, **BAE Systems Advanced Technology Centre**, who will address the Conference on 'Designing future soldier systems and defence platforms'

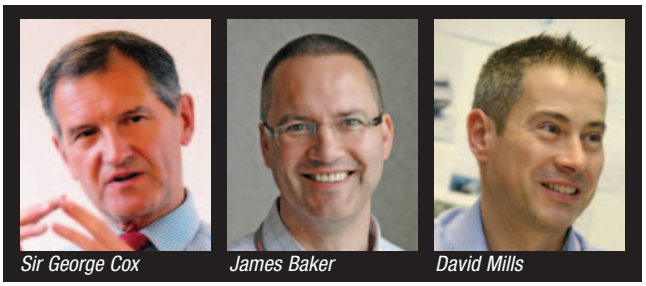
• Sir George Cox, former Chair of the Design Council, author of The Cox Review of Innovation in Business and current President of the **Institution of Engineering Designers**, who will speak on 'The strategic use of design'

• Tim Strafford, business development manager, **McLaren Electronic Systems** on designing and manufacturing an F1 engine control unit

• Dr Jamie O'Hare, eco design product manager of **Granta Design**, speaking about making more sustainable product choices

• David Mills, managing director of Haughton Design will discuss optimising the design development process

• PhD students James Chandler and Earle Jamieson will explain their development of a revolutionary haptic medical diagnostic system


Sir George Cox | James Baker | David Mills

Also included will be a panel discussion entitled 'IP – What is it Worth?' that will involve James Baker of BAE Systems Advanced Technology Centre; Nigel Robinson, partner, **D Young & Co LLP;** and Jon Calvert, managing director of **ClearViewIP**. Other speakers will include Richard York, director of product marketing, **ARM Holdings** and James Godman, head of **AgustaWestland** UK Innovation and Research (see p16).

Places for the Conference are limited, but Eureka readers registering for the show and entering the code 'EU2012' will receive a free Conference pass worth £75.

www.engineeringdesignshow.co.uk

Engineering design show

10th - 11th October 2012 · Jaguar Exhibition Hall · Ricoh Arena · Coventry

Committee calls for immediate action on STEM subjects

The House of Lords Science and Technology Committee has called for immediate action to ensure enough young people study Science, Technology, Engineering and Maths (STEM) subjects at both undergraduate and postgraduate level.

Without this, it said, the Government risks failing to meet its objectives to drive economic growth through education and hi-tech industries as identified in its 'Plan for Growth'.

The report stresses the important role STEM postgraduates play in economic growth by driving innovation, undertaking research and providing entrepreneurship. However, the committee said that the Government is failing to articulate how it will support postgraduate STEM provision in order to realise its plans for growth, explain to students the benefits of undertaking STEM postgraduate study or improve understanding about the demand for STEM postgraduates from industry.

The committee also identified a potential compound effect of the higher education reforms on postgraduate provision producing a 'triple whammy' effect due to higher fees, a lack of student finance, and a decline in the number of overseas students. The report calls for the establishment of an expert group, including substantial employer involvement, to formulate a strategy for STEM postgraduate education to help underpin plans for growth.

Commenting, Lord Willis, chairman of the Lords sub-committee on higher education in STEM subjects, said:

"The Government has made clear that education and hi-tech industry is vital to its plans to generate economic growth. However without a highly skilled and knowledgeable workforce that will not be possible. It is vital therefore that higher education in the UK has a strong STEM sector and is able to produce the graduates and postgraduates hi-tech industries will demand.


Dr Colin Brown, IMechE

Dr Colin Brown, director of engineering at the Institution of Mechanical Engineers said in response to the Lords Science and Technology Committee report into Science Technology Engineering and Maths higher education:

"The issue of insufficient skills is a very pressing concern for UK industry and the 3% drop in engineering graduates between 2003 and 2010 is very worrying. UK sectors like automotive and aerospace manufacturing are growing, and have the potential to spearhead the country's economic recovery, but only if they are able to recruit people with the right skills.

"A survey by the Institution of Mechanical Engineers earlier this year found that 76% of manufacturers are recruiting, but that 41% are struggling to find people with the right skills."

Sustainable manufacturing facility opens

Communities Secretary Eric Pickles has announced a £3.5million boost for manufacturing innovation at the opening of a new High Speed Sustainable Manufacturing Institute in Essex.

The new facility has been created in partnership with the Centre for Engineering and Manufacturing Excellence and Ford Britain. Located near Ford's Dagenham car factory, it will develop new and innovative ways to improve manufacturing techniques and increase productivity, with the aim of ensuring Britain remains a top choice for investment.

According to a statement, the Institute will develop state of the art virtual manufacturing systems to assist companies to develop and implement world leading manufacturing processes, which are often too costly for many organisations to design themselves.

It will bring together leading lights from the worlds of business, engineering and academia, employing 22 researchers and PhD students to work alongside six Ford research staff to create programmes that will help develop the skilled workforce needed.

Joe Greenwell, Ford of Britain chairman, said: "Ford is delighted to be a founding partner in this exciting new initiative. The Institute will accelerate research and development in innovative manufacturing systems that will help underpin the future of the UK's high value manufacturing sector. This complements the work that Ford is already doing in this area and also provides significant opportunities for supply chain partners."

www.ceme.co.uk

Make it in Great Britain show launches

Business Secretary Vince Cable has opened a new exhibition at the Science Museum in London to demonstrate to young people the rewarding career opportunities available in British manufacturing.

The exhibition is the culmination of the Government's Make it in Great Britain campaign and will feature a mix of displays from 39 businesses, including iconic names such as McLaren, Mars, BAE and Rolls Royce. The campaign was launched last year to change outdated perceptions of manufacturing and dispel the myth that the UK 'doesn't make anything anymore'.

"Generating £137 billion each year and employing 2.5 million people, manufacturing is a vital part of the UK's economy," said Cable. "Perceptions of the industry are outdated and need to change if we are going to attract the talent needed to support manufacturing in the long term. Both government and industry have a role to play, which is why we launched the Make it in Great Britain campaign and are hosting this exhibition."

Cable also used his opening speech to hit out at 'very disappointing' bank lending to SME manufacturers. "The medium-sized companies are struggling and the banks are not helping, particularly with exports," he noted. "There's no point disguising the fact that if you talk to all these guys they'll tell you they can't get banks to lend to them."

The exhibition launch was also attended by Business Minister Mark Prisk. He commented: "I'm delighted to launch this exhibition, as it will showcase some of the exciting great innovations of today. There is a range of rewarding career opportunities available, requiring advanced skills and expertise. I would encourage people to come along to the exhibition and see first-hand what manufacturing can offer them."

makeitingreatbritain.bis.gov.uk

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Andy Verwer, director, Verwer Training and Consultancy

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Gary Livingstone, managing director, LG Motion

MATERIALS

Innovative material selection to add value
Andy Pilling, strategic account manager, Albis UK

Functional plastics: A solution for future challenges
Dr Antti Helminen, research and development manager at Premix Oy (on behalf of Plastribution)

Better, more sustainable products through eco design and materials selection
Dr Jamie O'Hare, eco design product manager, Granta Design

ELECTRONICS

ECAD/MCAD integration in the electronics design process. How to get the best of both worlds?
Jörg Kaleita, technical account manager for EMEA, Altium Europe

Integrating switchmode power for OEMs
Matt Smith & Keith Barclay, applications support managers, TDK Lambda

How to get the right board manufactured without eliminating creativity
Jörg Kaleita, technical account manager for EMEA, Altium Europe

The selection implications of data conversion components for the overall analogue signal chain
Gary Biggins, FAE, Anglia and Charles Akokhia, Northern European FAE manager at Analog Devices

Engineering design show

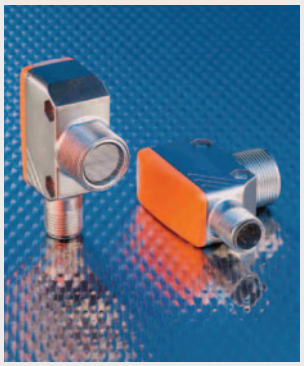
10th -11th October 2012 · Jaguar Exhibition Hall · Ricoh Arena · Coventry

For free workshops to assist with your design projects,
join us on 10th & 11th October by visiting **www.engineeringdesignshow.co.uk**

SMALL AND ROBUST PHOTOCELLS FROM IFM

ifm electronic has launched new versions of its OG Cube design photocells designed for AC operation.

The OG Cube is both a sensor with standard M18 thread fitting and a compact rectangular housing. From whichever viewpoint, the OG Cube is a robust metal sensor, available in through-beam, retro-reflective sensor and background-suppressed diffuse versions.



What is new with this product, however, is the ability to operate on normal AC mains power up to 250V AC, with leakage current of only 1.7 mA.

The sensor is cited by the company as being the optimum choice for a severe industrial environment. The powerful technology in a compact and robust housing provides high flexibility when used in adverse applications where space is restricted.

A minimum drift when light and dark objects are detected means the sensor achieves long ranges which remain constant even with coloured backgrounds.

Furthermore, the operation of the sensor is colour-independent for grey-scale and black values. A high repeatability as well as fixed ranges for a quick set-up are more positive features of this sensor.

www.ifm.com

Inverters cover broad range

SK 200E series frequency inverters from Nord Drive Systems provide solutions for any application where cost efficient drives with a performance between 0.25 and 22kW are required.

Available for installation near the motor or as motor-integrated models, various types cover all typical distributed applications. Frequency inverters from the SK 2x0E line, for instance, are equipped with a process and PI controller, and qualify for use with fans and pumps through their internal 24V power supply and

two analogue inputs.

By contrast, the SK 2X5E line is tailored for the needs of conveyor technology. Inverters from this series are equipped with a brake controller and two integrated potentiometers which allow for easy adaptation to the requirements of any drive task. Thanks to standard features such as speed feedback (servo mode) and a positioning function (POSICON), these inverters can also independently and precisely control positioning and lifting tasks.

The units are performance-graded and can be fitted with various optional add-on functions, allowing users to choose suitable compact devices with the exact feature range for any given task, thereby optimising resource use.

www.nord.com

Renold guarantees Synergy life

Renold has guaranteed the wear life of its extra long lasting chain Synergy. The company even guarantees a new Synergy chain will last at least three times longer in wear, than a customer's current chain or the next one is free.

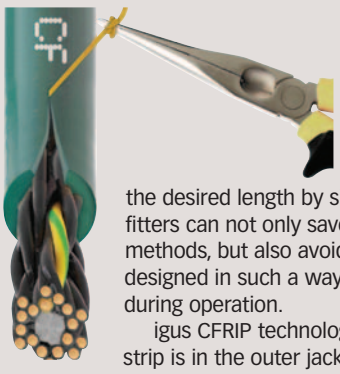
Synergy was launched 12 years ago to provide customers with a high performance solution, to last significantly longer, cut downtime and increase productivity.

Independent tests have shown that Synergy's wear resistance is up to six times better than the next best chain on the market. And on some applications it has even gone so far as to outlast the customer's previous chain by even more than that. Synergy was designed to perform, and uses the latest

cutting edge engineering techniques and manufacturing technology to significantly enhanced performance.

www.renold.co.uk

Solution to last month's Coffee Time Challenge



The solution to last month's challenge of how to strip electrical cables quickly, efficiently and safely comes from igus, whose chainflex CFRIP offers an intelligent solution for solving that very problem of stripping back long lengths of cable. By integrating a tear strip into the cable jacket, CFRIP simplifies the stripping back of the cables (especially for those with gusset-filled extruded jackets) without damaging the cores.

With just a few steps, the outer jacket can be opened like a zipper to the desired length by simply pulling the special CFRIP tear strip. Electrical engineers and panel fitters can not only save 50% of the cable stripping time typically required using conventional methods, but also avoid the need for additional cable stripping tools. The cables are also designed in such a way that the integrated tear strip doesn't damage the outer jacket or cores during operation.

igus CFRIP technology is offered in the chainflex CF5 PVC control cable family, where the tear strip is in the outer jacket, and in the chainflex CF6 shielded version, where the tear strip is in the inner jacket. Other types of chainflex cable integrating CFRIP technology are being considered.

www.igus.co.uk

Piezoelectrics replace mechanical operation

Cambridge-based TTP has invented a revolutionary new miniature gas pump that replaces traditional mechanical operation with ultrasonic pressure generation technology to deliver greatly reduced size and silent running. The innovative, patented micro Disc Pump has already been commercialised as a wound therapy application and is ideally suited to other portable medical applications such as blood pressure measurement, as well as micro-fluidic and industrial applications where size, noise and controllability are important design factors.

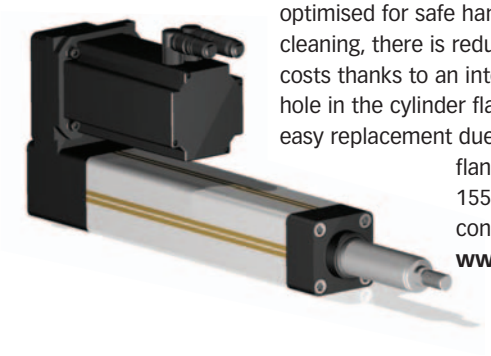
Disc Pump's ultra-slim design is achieved by using a piezoelectric actuator to drive pressure oscillations in a thin disc shaped cavity: one current model measures just 4mm in thickness. Silent operation is achieved by running the pump at frequencies above the limit of hearing, using special custom, high-speed valves to rectify the pressure oscillations.

The combination of pressure generation technology and high frequency operation make it possible to deliver pneumatic performance significantly higher than traditional pumps of comparable size. With a wide dynamic range, the TTP technology has already achieved stall pressures in excess of 600mbar and flow rates of more than 2,500cc/min. The high-frequency piezoelectric mechanism provides virtually ripple-free output compared to conventional pumps.
www.ttp.com

Electro-cylinder enhanced

The series of Parker ET electro-thrust cylinders, which are widely used in thousands of different applications, has been completely redesigned and enhanced. This ballscrew actuator delivers up to five times the force and 10 times the life of the previous ET in the same frame size. With the new ETH electro-thrust cylinder Parker has succeeded in setting new standards for power density and lifetime of electro-mechanic linear actuators

The new features include higher power density, an integrated anti-rotation device, reduced noise emission, the home/limit switches and cables can be concealed in the profile and a very high service life greatly increasing lifetime up to factor 5. Furthermore they are optimised for safe handling and simple cleaning, there is reduced maintenance costs thanks to an integrated lubricating hole in the cylinder flange and they are an easy replacement due to pneumatic ISO flange norm (DIN ISO 15552:2005-12) conformity.
www.micromech.co.uk



Green **skies**

Aviation and air travel are riven by disagreement and difference, with various perspectives and interests driving diverse and often contradictory actions. While many want to bolster the proliferation of the commercial aviation industry to help drive economic growth, others level ever-greater criticism of its environmental impacts.

Despite the amazing technological feats of pedal-powered and solar powered aircraft being researched and flown with great success, this remains novelty engineering and it is unlikely to offer any kind of alternative to the industry's current predicament.

It is much more likely that engine technology and aircraft structures will continue evolving, with airframes and engines not looking too dissimilar to many of today's aircraft, but with an environmental impact that is, perhaps, unrecognisable.

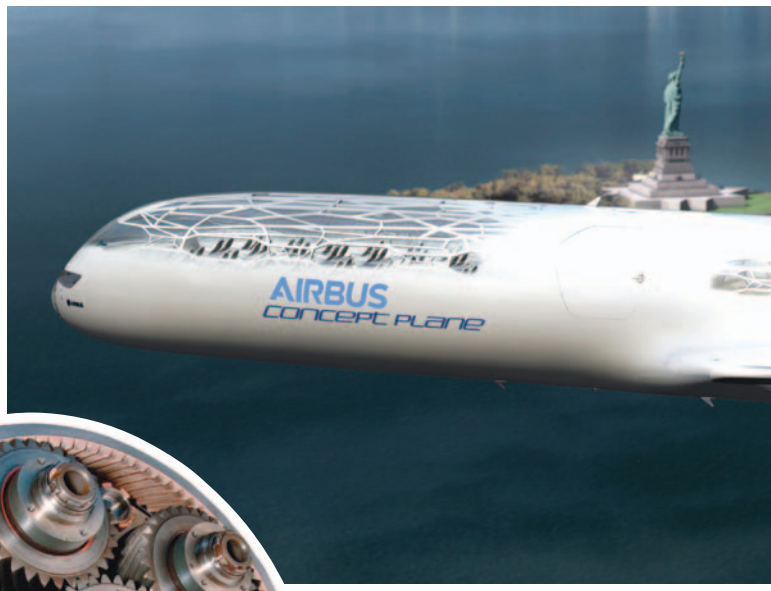
An average transatlantic flight can consume 60,000 litres of fuel – more than the average motorist will use in 50 years. However, this should be qualified. For the moment large gas turbines are the most efficient machines we have for converting fuel into mechanical power, sometimes at over 50% efficiency.

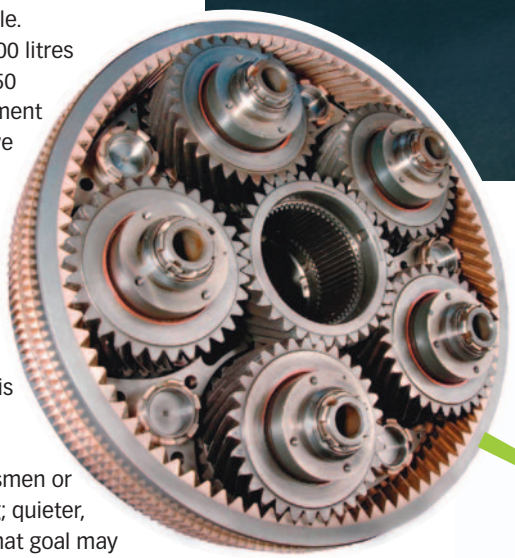
In addition, some aircraft carry over 500 people, meaning that per-person efficiency is actually very good (a car would need to do around 100-120 miles per gallon to be equivalent). Equally, despite the aviation industry continuing to lower fuel burn by about 2% per year over the last 50 years, the sector is the planet's fastest growing CO2 producer. This, the industry says, must change.

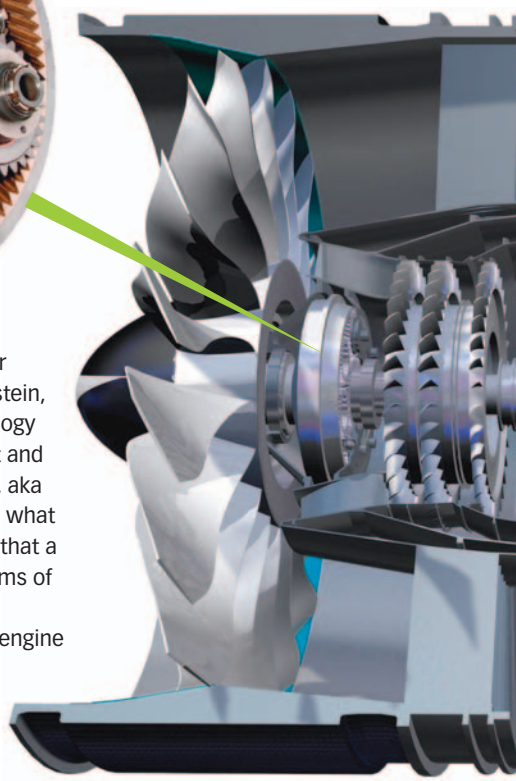
Be they environmentalists, industrialists, businessmen or consumers, most people want to see the same thing; quieter, cleaner aircraft that ideally produce zero-net CO2. That goal may well be met in the future with biofuels created from organic matter. Drop-in, bio-based alternative fuels can create kerosene equivalent fuels and chemical scientists continue to try to make this process both consistent and cost effective.

In the shorter term, however, industry is looking to engineers to offer solutions. One of the most anticipated breakthroughs comes from classic mechanical territory in the form of a highly efficient planetary reduction gear.

US engine maker Pratt and Whitney has been developing the concept for some 25 years. Turbofan engines use a 'bypass ratio', the air flowing through the fan disks (which bypasses the engine) against the air drawn in to the engine core for combustion. At the moment the very best engines are up to 8:1 or 9: 1, but they are reaching a limit. One of the limiting factors is that the engine shaft transmits power directly to the fan blades, i.e. they rotate at exactly the same rate.





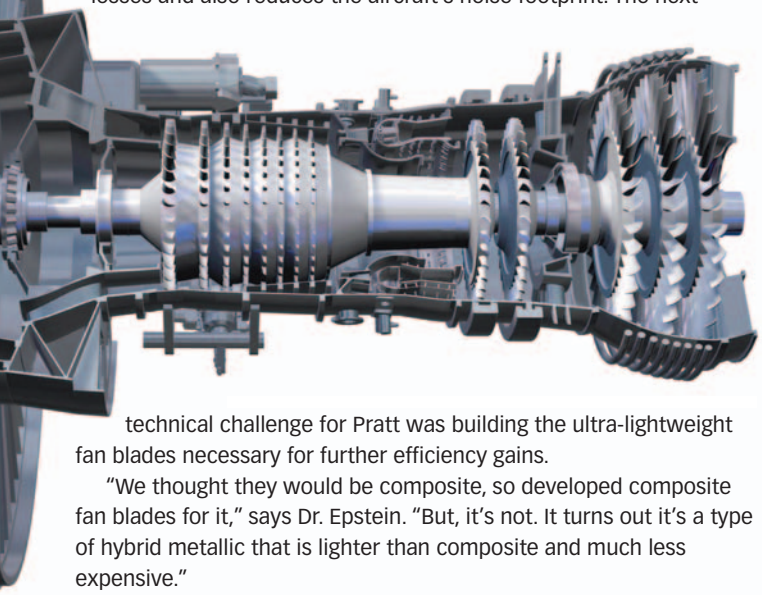


"You can't fool Mother Nature," says Dr Alan Epstein, Vice President of technology and environment at Pratt and Whitney. "Mother Nature, aka thermodynamics, tells us what we have to do. It is clear that a gear is a good idea in terms of changing the speed ratio between the core of the engine that makes the shaft power, and the fan that propels the aeroplane. But, in

The aviation industry has always been a platform for innovation and technology. Justin Cunningham finds out how engineers are developing the more efficient aircraft of tomorrow.

practical terms what that means is, the gear cannot weigh very much or cost very much, and must be very efficient. So, for a medium-range narrow-body aircraft, the gear is about 0.5m in diameter, weighs about 100kg, but transmits about 25MW at over 99% efficiency."

The gear added to a conventional engine improves fuel burn by 2%. The larger fan blades have a slower rotation and this reduces losses and also reduces the aircraft's noise footprint. The next



technical challenge for Pratt was building the ultra-lightweight fan blades necessary for further efficiency gains.

"We thought they would be composite, so developed composite fan blades for it," says Dr. Epstein. "But, it's not. It turns out it's a type of hybrid metallic that is lighter than composite and much less expensive."

The structure of the engine means a higher bypass ratio can be achieved and therefore a bigger fan can be used, which needs to sit in a nacelle. The nacelle needs to be very lightweight and also have low drag so that it doesn't overwhelm any performance advantage gained from the increased size. The result is a thin, low-drag, lightweight design that incorporates a variable area nozzle.

The fan blades and nacelles both offer a further 2% fuel burn saving each, but instead of the sum of parts offering a total of 6% improvement, optimisation of the entire system means the engines offer some 16% improvement of fuel burn over predecessors.

Dr. Epstein adds: "The bad news is, if the engineers do not deliver – if one of these technologies doesn't actually work to the degree that we need – then we don't have 16-2 = 14% fuel burn improvement, we have 4%. And the difference between 16% and 4% is an utter disaster."

Both the major large commercial airframe manufacturers, Airbus and Boeing, have offered their designs, which are likely to be flying for at least the next 20 years. The Airbus A350 XWB and Boeing 787 Dreamliner are both highly-optimised technical marvels that use the latest materials and technology to make them the most refined aeroplanes ever flown.

That said, however, take off all the logos and to most novices they look the same, with slight differences in terms of wing sweeps, wing tips and the cockpit, but the essential layout is the same. Furthermore, take off the engines and, size apart, there is not a dramatic difference between them and a 747-400 or even the first Boeing commercial airliner, the 707.

The aircraft industry is by nature conservative. It has to be sure of its next step, so radically different airframe designs, such as flying wings, boxed wing sections or even multiple fuselages, are probably a long way off – if they ever arrive at all.

Airbus has recently come up with its 'Concept Plane' design which shows what aircraft could look like in the distant future, somewhere between 2030 and 2050. The Concept Plane is quite distinct. First, it has much longer, more slender wings than today's aircraft. These will allow the aircraft to glide more easily and reduce fuel burn significantly.

The engines are also semi-embedded into the aircraft structure. These are placed toward the rear of the aircraft to reduce cabin noise and the integration of the engines is made possible because the increase in reliability will mean that engine access does not need to

be as regular as it does at present. In addition, the exhaust is on the top of the tail section to reduce the noise footprint on the ground below.

Boeing did have fairly radical plans for the future and carried out numerous studies in to a Blended Wing Body layout. It has even flown a prototype called the X-48B, which does without a conventional tail or rudder, and instead uses 20 control surfaces on the trailing edges of the wings and rudders on the winglets. However, Boeing found that the layout was not popular with passengers, so dropped the design for a passenger aircraft, but left open the possibility of using it as military refuelling tanker.

Dr. Allen Adler, vice president of enterprise technology strategy at Boeing, says: "We see beyond the materials we are using right now and understand that they will enable us to take on new designs. If anything is going to lead to a revolutionary [airframe] it is going to come from a materials breakthrough. But things spend a long time in a laboratory before being incorporated into an aeroplane."

In the nearer term, the company is undertaking a programme called the ecoDemonstrator, in which it aims to trial and commercialise various technologies that can be quickly rolled out to help reduce environmental impact. The chevrons that are commonly seen on engine nacelles were the result of a similar programme undertaken in 2001, and go a significant way to reducing noise.

Jeanne Yu, director of environmental performance at Boeing, says: "The goal of the ecoDemonstrator programme is to accelerate integration of these technologies for more fuel efficient, quieter, cleaner, more advanced solutions for the future. This helps us incorporate these technologies more rapidly."

It begins a 45-day test programme later this year to trial different fuel-saving technologies. Active engine vibration control systems are to be fitted that could potentially cancel out any vibrations created at low engine speeds. At the moment, many pilots have to throttle up to stop engines vibrating unduly on approach to a runway. This wastes a quantity of fuel that, although fairly insignificant on the individual flight, multiplied over many years in fleets throughout the world, the savings becomes significant.

Mechanical engineers have also come up with an ingenious mechanism to adjust the trailing edge of the wing to give optimised aerodynamic characteristics at different phases of flight (which are at the moment fixed). However, perhaps the most interesting is the variable area fan nozzle which adjusts the size of the engine's exterior nozzle to again allow it be optimised for certain flight conditions. An onboard fuel cell will also be trialled as an onboard power system. It hopes all these technologies will soon be rolled out.

With its parent company EADS, Airbus is also making small but technologically significant strides to improve its footprint with rapid manufacturing technology. Jean Botti, chief technology officer of EADS, says: "Additive Layer Manufacture (ALM) is a 3D rapid manufacturing technology for engineering not just for research. We can build parts that are very complex. This is not for high-volume, so is quite well suited to our industry which is about lower volumes. We can make very complex parts that optimise the weight.

"The machines exist, we are keeping an eye on the alloys and materials themselves but we can save a lot of weight and have much less wasted material so we see this as a key development."

It is crucial for the aviation industry to develop cleaner technologies so it can sustain its current activities but this also offers tremendous opportunity in wider engineering activities. The aviation sector is pushing at the moment for breakthroughs. And like many of its previous innovations, the trickle-down of technologies to other sectors and industries is almost guaranteed. It is likely the implementation of new materials, power transmission and even rapid prototyping technologies are likely to find other applications in many other sectors.

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See through aircraft... as you fly?

The Airbus Concept Cabin illustrates what the future of flight might look like from the passengers' perspective. The cabin could use a bionic structure that could be coated with a biopolymer membrane to controls the amount of natural light, providing transparency on command and eliminating the need for windows.

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Getting airborne

Following his formative experience with Concorde, James Godman went on to gain work experience with British Aerospace in Filton, followed by a nine-year stint in the RAF that culminated in him joining what was then Westland Helicopters in Yeovil. Here, he has risen to become head of AgustaWestland UK research and innovation department

A flying start

For James Godman, a youthful acquaintance with the development of Concorde led to a highly successful career in aerospace engineering. Paul Fanning finds out how he is trying to inspire others to follow a similar path.

Despite describing himself as never having had "a clear mission in life", AgustaWestland's UK head of research and development James Godman has little doubt about what it was that drew him towards the aerospace industry.

"Concorde was being manufactured at that time," he says. "And my father was involved – he designed the air intake, in fact. I went to a school that was close to the runway and, as soon as we heard the engines roaring and the aircraft coming down to taxi, we'd be on our pushbikes and would head off for the bottom of the runway. They closed the road and you'd see it take off and land. So if you look back and think about the things that subconsciously drive you to do what you do, I've always had a passion for manufacturing in the UK and I think that stems back to the Concorde experience."

It was sharing this story with Minister for Business and Enterprise Mark Prisk at a summit in Bristol that led to Godman's involvement with the 'Make it In Great Britain' campaign, which aims to counter myths about the UK's manufacturing industry and encourage young people to enter industry.

He says: "I think it's a very good initiative and much-needed. Manufacturing has never been flavour of the month and isn't often put at the forefront and we don't always realise what we've got in the UK in terms of skills, capabilities and, most importantly, creativity."

One of the factors that have made this campaign necessary, Godman feels, has been a lack of visibility on the part of manufacturing and engineering that has led to them being ignored or disregarded. "The country needs to understand how significant [manufacturing and engineering], are" he says. "If we stand back and look around us, everything that surrounds us is designed and manufactured. Everything we use is designed and manufactured. But do people appreciate the work involved in the design and manufacture of everything we use? I don't think so."

All this, he believes, is in spite of the fact that the rewards of a career in engineering are enormous. He says: "What excites me are the possibilities – the possibilities of designing something, building something and building a life based on that. To have the opportunity to explore your thoughts and imagination and to be able to turn that into an end product – there aren't many jobs where you can do that."

The intention is for Make it In Great Britain to produce 30 ambassadors – a group of young and dynamic, next-generation engineers across a range of sectors to act as champions for manufacturing and tell people about the opportunities.

However, Godman is under no illusions as to the scale of the challenge, saying: "The media bombards kids with any number of options. How we help them understand and guide them is a significant challenge."

Rather than being a problem purely for the future, he emphasises that the shortage of good candidates is something that is adversely affecting the industry now. He says: "I know that colleagues in other companies are severely challenged when they go to look for new graduate engineers or even apprentices. There's a major resource challenge there. The University Technology Centres and the other initiatives will obviously make a difference, but it's a question of timing. It takes time for people to come through the system."

Nonetheless, Godman remains positive about the state of engineering in the UK, being encouraged by the Government's new-found enthusiasm for the sector. He says: "From the point of view of my industry, there has certainly been a significant change in terms of investment and focus. We've got initiatives like Catapult Centres, University Technical Colleges and the National Composites Centre… there really is an upward beat with relation to the Government's involvement with industry and the way they're trying to assist and are assisting in key strategic initiatives."

"The country needs to understand how significant manufacturing and engineering are"

An area where Godman believes government has a significant role to play is in facilitating cross-sectoral communication with manufacturing. Successful examples of this cross-fertilisation, he claims, include aerospace's automotive-inspired move towards greater automation and automotive's aerospace-inspired use of advanced materials.

"There's a balance to be found between designing, manufacturing, supporting and improving your own product and also being able to look out across other sectors and see how you can adopt new technology and adopt it into our business. Otherwise, you end up with lots of sector-specific expertise, but with lessons learned not being shared across industry."

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Moving away from rare earth motors

With the supply of rare earth elements being restricted and demand escalating, firms are increasingly trying to develop alternatives. Justin Cunningham reports.

Supply and demand is a fact of life and very much at the heart of business. For many engineers, the cost of materials and components can encourage innovation as much as it can restrict it. For most, cost remains the biggest driver and any dramatic or sustained spike in component pricing will likely see many look elsewhere for lower-cost alternatives.

That is the view largely echoed by electric motor manufacturers and users at the moment. The cost of the rare earth materials used to make the powerful magnets has gone up six times in the last few years alone, giving OEMs and their suppliers serious cause for concern.

To date, China has produced around 95% of the world's supply of rare earth elements. However, it is putting an ever-tightening stranglehold on the supply of these materials, reducing exports and preciptating a worldwide shortage. Naturally, this has dramatically increased price.

Conspiracists might suggest this is a concerted effort by China to control supply so it can hike up prices of the materials and exploit the increasing demand from the lucrative wind energy and electric/hybrid car markets, both of which are expected to grow massively in coming years.

Whatever the motives, the result is the same; the price of the commonly used elements neodymium and dysprosium are skyrocketing. But this is having another effect on industry, as engineers struggle to keep costs under control, more companies are seeking and developing alternatives.

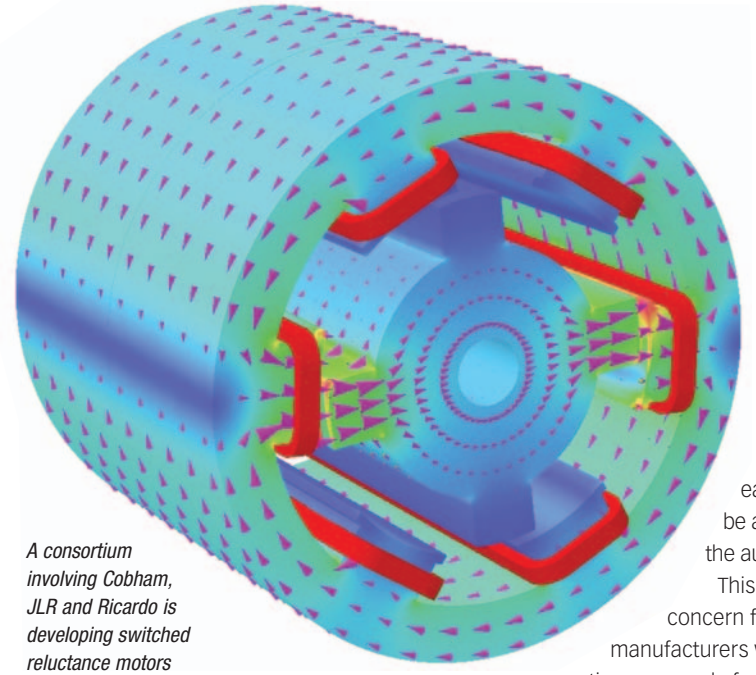
Dr Sab Safi, a consultant to SDT Drive Technology, says: "There is a possibility that rare earth magnets may become unavailable or too expensive and this justifies efforts to develop innovative designs for permanent magnet motors that do not use rare earth magnets."

SDT Drive Technology in Southampton has been considering and exploring the need for different types of electric motors that do away with the need for rare earth materials, particularly for use in hybrid and electric vehicles. It suggests that both induction motors and switched reluctance motors have the potential to offer similar performance without using rare earth metals.

Induction motors are relatively low cost and lightweight, but are generally bigger than equivalent rare earth motors. In practice, many electric vehicle designs employ induction motors, yet induction motors for hybrid electric vehicles have to date not been so popular. There is an opportunity for enhanced induction motor designs that utilise advanced manufacturing technologies, materials, and control methods. And while research on hybrid permanent magnet motors and switchedreluctance motors, in addition to comparisons of both is available, it sometimes ignores induction motors as a suitable alternative.

Switched reluctance (SR) motors are similar to stepper motors except the stator phase currents are switched based on rotor positions, hence the name. Although the technology is pretty well established, it is only recently that advances in power electronics, digital control and sensing technology have allowed SR technology to compete. As a result the technology is gaining popularity within the automotive sector. "SR motors are especially well suited for rugged applications or high-speed applications where high power density is needed," says Dr Safi. "They also offer a long constant power range which makes them highly favourable for vehicle traction applications. However, higher speed operation may cause high mechanical losses due to aerodynamic drag and viscosity losses."

SR motors are increasingly being made commercially available by a number of companies that are rolling them out to the automotive sector. This situation has also prompted a consortium of UK technology



A consortium involving Cobham, JLR and Ricardo is developing switched reluctance motors

companies to undertake a research programme to allow better design and modelling capability of SR motors. Headed by Oxford based Cobham Technical Services and co-funded by the TSB, the group includes Jaguar Land Rover and Ricardo. It will also be looking at developing the next generation of switched reluctance motors that avoid the inherent expense of rare earth magnets, and provide tools to enable engineers to take up the technology.

Cobham will develop multi-physics software, and capture the other partners' methodology in order to design, simulate and analyse the performance of high-efficiency, lightweight electric traction motors that eliminate the use of expensive magnetic materials. Using the software tools JLR and Ricardo will be able to rapidly design, develop and manufacture a prototype switched reluctance motor that addresses the requirements of luxury hybrid vehicles.

Kevin Ward, a director at Cobham Technical Services, says: "Cobham will also develop its existing SR motor capabilities to provide the consortium with enhanced tools based on the widely-used Opera suite for design, finite element simulation and analysis.

"In addition to expanding various facets of the Opera electromagnetic simulator capabilities, we will investigate advanced integration with our other multi-physics software to obtain more accurate evaluation of model related performance parameters such as vibration."

Hitachi has developed a motor that uses an iron-based amorphous metal in the core

However, for many applications there is simply not a realistic alternative in the market for rare earth magnets just yet. They still offer the best power density-to-size ratio and for more bespoke applications, performance still largely outweighs cost at the moment.

Maxon Motors uses three types of magnets in its motors; Neodymium, Alnico and some ferrites. Neodymium is more common for precision types of products and is rare earth derived. Although it is the most expensive, it does give the best performance. The other alternatives are Alnico, an aluminium nickel, and some ferrites. These cost less, but have much lower performance.

Paul Williams, sales engineer with Maxon Motors, says: "What we have found is the cost of rare earth magnets has gone through the roof. So people have started to move, if they can, to an Alnico magnet. But this means the sizes go up. For a lot of our applications, we need that performance but in a small size. If size isn't important to you, you can obviously use a lower-cost magnet."

Around 60% of Maxon Motor applications are bespoke in some way, so it uses a high degree of application knowledge and can modify the motor to suit the application.

"For us it is quite a significant cost of the motor," says Williams. "We have had to put a rare-earth surcharge on the magnets at the moment and this has an impact on the cost of the motor.

"The major cause for concern in the market is within the automotive industry with hybrid and electric cars relying on the superior power density provided by rare-earths. Can they find suitable alternatives or will the market for rare earth stabilise pricing? The fact is that the volatile price changes rare earth magnets will not be able to sustained within the automotive industry."

This is also of particular concern for Japanese manufacturers who rely on a continuous supply from China to export their cars abroad. Japan has neither the raw materials or enough in its recycling waste stream to support the demand of its local markets. This is therefore prompting similar moves across the Pacific by electronics powerhouse Hitachi. It, too, is developing motors that don't use rare earth elements, no doubt to satisfy demand from companies such as Toyota, which uses around 1.4kg of neodymium in every Prius.

Hitachi has recently announced an 11kW, highly-efficient permanent magnet, synchronous motor that does not use magnetic material containing rare earth metals such as neodymium or dysprosium. Instead, the motor uses an iron-based amorphous metal in the core. The key challenges were technologies such as structural optimisation and minimising losses in the core.

Compared to conventional motors of the same class, the motor is smaller and achieves an energy efficiency of approximately 93**%** which fulfils the highest standard of IE4(2) efficiency guideline.

Hitachi also developed technology to optimise the structure of the axial gap motor to efficiently use low-magnetic ferrite material and a stratified core structure, which efficiently draws out the low energy loss characteristic of the amorphous metal.

Most electric motor companies are concerned about the increasing scarcity of rare earth elements and it is clear that many industries are actively seeking alternatives. While some more bespoke applications continue to use the rare earth metal motors, if the trend of rising prices continues, there will be a crossover sooner rather than later when the trade-off between cost and performance swings the other way.

www.sdt-safidrivetechnology.co.uk
www.cobham.com
www.maxonmotor.co.uk
www.hitachi.co.uk

A fresh perspective on CAD software

A new company has launched a cloud-based ecosystem for 3D design and collaboration that it claims will democratise CAD. Laura Hopperton reports.

A start-up with a mission to make 3D design fast, easy and affordable has launched a new cloud-based platform that could offer users a much cheaper alternative to traditional software.

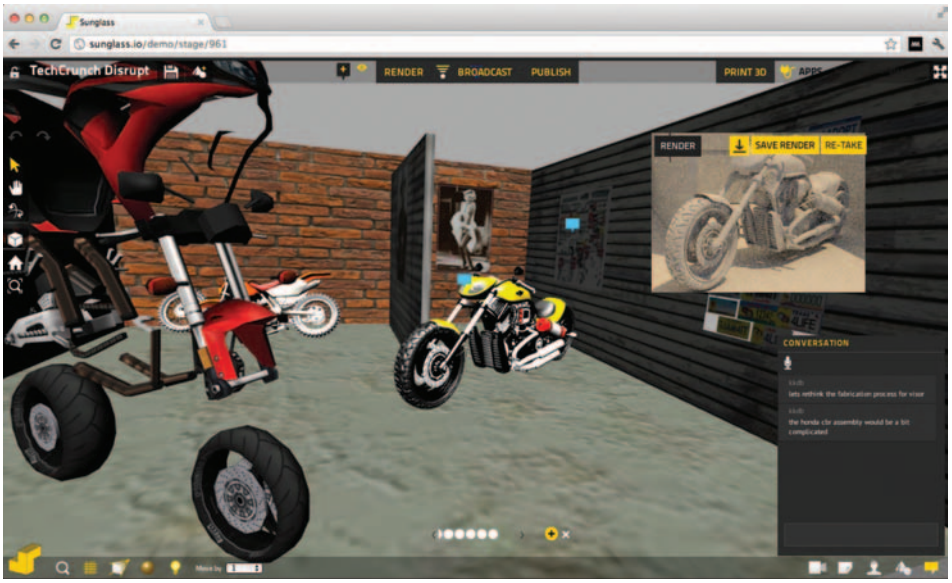
San Francisco-based Sunglass claims the platform, which is currently still in beta, offers users something completely new in the CAD space: the ability to work with anybody on any project from any device.

"Think of it as Google Docs for 3D objects," says co-founder Nitin Rao. "What we've developed is a cloud-based ecosystem for democratised sharing that works completely in the browser, with support for more than 40 different file formats. We've also created an API for direct integration to major CAD tools such as SolidWorks, SketchUp, Processing and Rhino, as well as cloud storage players like Dropbox."

These software hooks, according to Rao, create a seamless path for importing 3D models from desktop software directly into Sunglass, making it easy for users to add to projects or initiate new collaborative sessions in the cloud. The API is also said to benefit developers by giving them a simple way to create a plug-in from any CAD tool directly into the platform.

After installing plug-ins, users can upload models to Sunglass from within these desktop applications to instantly access a single 3D model with anyone, anywhere in the world. They can also suggest tweaks through chat or voice chat and use a sketch tool for marking suggestions.

"What we've developed is a cloud-based ecosystem for democratised sharing."
Nitin Rao
Co-founder
Sunglass



"Not only is Sunglass very social, it's also fluid enough that anyone from an expert designer to a complete novice can use it," says Rao. "While in the past it was a case of 'makers turn left, serious designers turn right', Sunglass completely democratises design and cuts across all disciplines. We've also made the basic platform completely free, which means designers only have to pay for the add-ons that they need."

The company's immediate focus, according to Rao and fellow co-founder Kaustuv DeBiswas, is to make the platform capable of handling 2D and 3D models of varying complexities in a constrained budget. "We'd also like to be a delivery channel for people with great ideas to build modular, bite-sized apps in the areas of analysis, modelling, rendering and publishing," noted DeBiswas. "Developers from all over the world are building fantastic tools, but they often aren't able to get them to hundreds or thousands of users. We want them to be able to do that."

Rather than pursue a monthly subscription model with a standard set of paid premium features, the idea behind making the basic version of Sunglass free, according to DeBiswas, was to make 3D design accessible to everyone. "When we first took Sunglass into the market to test it, the first thing designers were so surprised about was the cost. They were spending crazy amounts of money for software that was more antiquated."

Rao concurred: "Sunglass is substantially cheaper than competing platforms and designers love it because it brings a completely new and fresh approach to CAD. Not only have we overcome the issues of interoperability and cost, we've created a next generation collaboration tool that is extremely social. What we need now is for designers to test the platform and give us feedback so that we can continue to improve it. We're also inviting people to come forward with their app ideas."

www.sunglass.io

CFD takes on a new dimension

The first commercially-available, general-purpose native 1D-3D computational fluid dynamics simulation software has been launched. Paul Fanning finds out more.

Computational Fluid Dynamics (CFD) has been used by specialists for years to analyse fluid (liquids and gases) flows and heat transfer of complex mechanical systems. However, today's pressures to bring products to market faster and at reduced cost means that mechanical CAD designers and engineers, in addition to specialists, be able to perform these analyses directly in their mechanical design system.

3D CFD has thus become an intrinsic part of many CAD packages. One of the leading suppliers of this CFD has been Mentor Graphics, whose FloEFD is embedded in both Siemens' CATIA and PTC's Pro/Engineer. By embedding such a sophisticated component analysis program within the user's preferred CAD package at the earliest stages of design, it is argued, cuts the number of costly physical prototypes, and reduces simulation time by 65-75%.

A complementary, but (until now) discrete technology is 1D CFD for the analysis of complex engineering. Following its acquisition of the UK-based Flowmaster Group this year, Mentor Graphics now owns the Flowmaster 1D CFD solution, a fact that has led to it coupling 1D and 3D technologies in a commercially-available, general-purpose 1D-3D native CFD solution.

Traditionally, 1D and 3D CFD have had very distinct advantages, which has led them to be considered incompatible. Systems engineers commonly use 1D and 3D CFD software in the automotive, aviation, oil, gas, power and energy industries. For designing complex systems, 3D CFD would be extremely accurate but it can be computationally expensive depending on the size of models used. Therefore, 1D CFD is used, which is faster, but may require significant amounts of data to characterise the components accurately.

By integrating highly detailed snapshots of 3D component analysis within the 1D system-level models, Mentor Graphics is now able to provide higher accuracy for the components while minimising the resources and execution times required.

"When the systems run together, they can only run at the speed of the slower. The solution was to decouple the two."
Morgan Jenkins

The difficulty in developing this new system, according to Flowmaster's product line director Morgan Jenkins, was in uniting the two technologies without compromising either. "When we started this process following the acquisition, the original idea was to achieve some sort of co-simulation," he says. "However, it soon became clear that, when the two systems run together, they can only run at the speed of the slower. This solution was designed to decouple the two to prevent compromise. The 3D characterisation is stored in Flowmaster's relational database and can be used in future models, but is essentially a snapshot and is not slowing down the other system."

This, it is felt will have a hugely beneficial impact on design projects, allowing much more seamless collaboration with ever greater access to detailed information. Says Jenkins: "A powertrain engineer may need a virtual representation of the engine within the system diagram. Once upon a time, they would have gone to a dedicated MCAD engineer to get a 3D virtual prototype. By reducing the amount of time taken to get essential component information to system designers, it smoothes the design process enormously."

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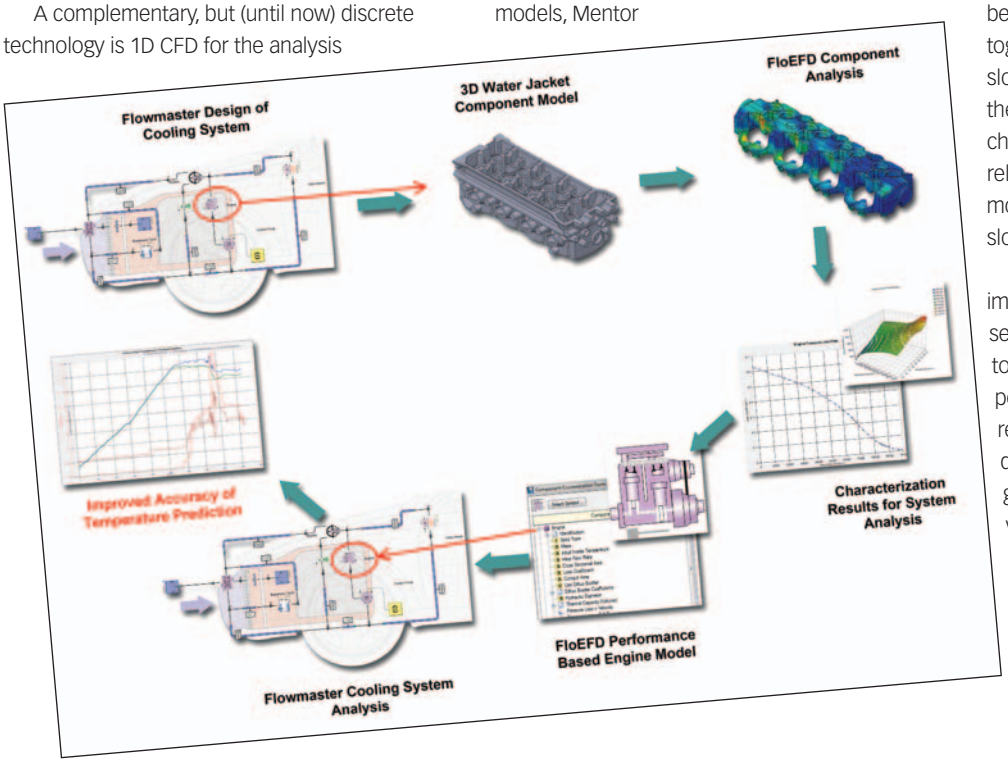


Making the right connections

Paul Fanning finds out about a fastening technology invented in the UK that, it is claimed, will revolutionise how we interact with everyday objects in the future.

For all that fastening and joining technologies are intrinsic to so many innovative products, it is fair to say that 'innovative' is not a word that most engineers would normally associate with the technologies themselves. Fastening is generally the unsung hero of design, often taken for granted and sometimes not even considered until other aspects of the design have already been finalised.

This makes it particularly exciting when a genuinely innovative fastening technology does emerge – as it appears to have done with the British-developed Rotite system, which its inventor Stuart Burns describes as "potentially the most innovative mechanical fastener in terms of its mechanical interface since the screw thread."

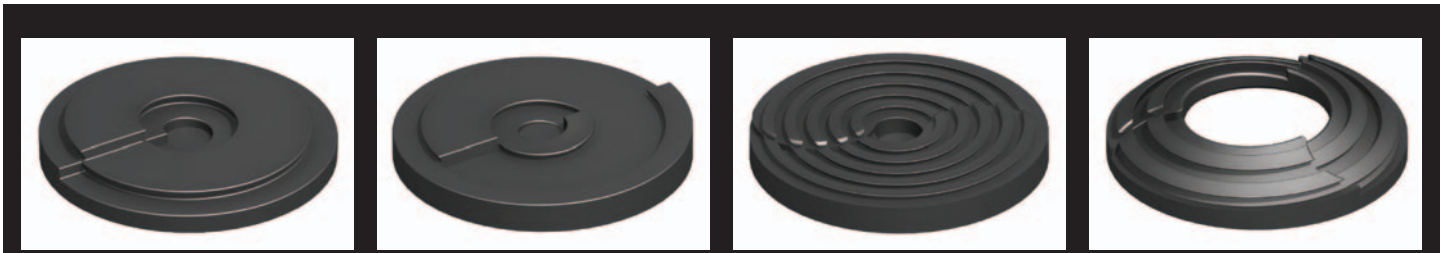
This is a massive claim, of course, but Burns' excitement is perhaps understandable when one starts to appreciate the potential of his invention.

The fundamental principle of Rotite (which Burns is at pains to point out is a system rather than a product), is essentially a low-profile, helicoidal dovetail. Basically, this means that the two surfaces dovetail together and can be rotated against one another until the required tightness is achieved. Thus, the dovetail connection can be rotated 360° about an axis on a helicoidal pitch.

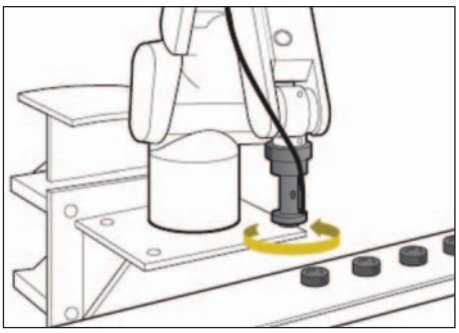
In the same way as a thread can have a number of starts points, so can Rotite. For every additional start point required, the number of degrees of rotation is reduced. This feature means Rotite can connect two items with 360° of rotation, 180, 120, 90, and 45° down to a minimal 10°. All variations of rotation from 10-360° provide full surface interlock between opposing connectors, which results in a low-profile, but high-surface area connector.

This confers an additional advantage in that Rotite can be 'hermaphroditic'. In other words, geometries of certain profiles can also be identical, meaning that objects can be connected without the need for A and B or 'male' and 'female' components.

Burns claims that the Rotite has has "limitless" derivatives, and literally thousands of potential uses in dozens of key industries. Possible industrial applications include domestic goods right through to aeronautical applications. It can be a connector or coupling that may be used for transmission, electrical connectivity, electrical/control sequencing, fluids or gases,



The fundamental principle of Rotite is its low-profile, helicoidal dovetail



The Rotite system offers benefits to manufacturing...

and general product enclosures.

Among the key advantages of the system is its low profile, which allows it to be used in applications where aesthetics or aerodynamics are major concerns. Its geometry also means Rotite has the ability to apply high axial loads without the necessary rotation of normal screw mechanisms, saving time and effort while also simplifying mechanics.

Although the system's mechanical interface is complex, Rotite is actually very easy to grasp and use from a consumer's perspective. Indeed, Burns believes that this apparent simplicity is one of the system's greatest strengths. He says: "It's intuitive because it uses an ergonomic twist action, so it feels familiar and this makes it is extremely simple to use and has positive benefits for everyone, regardless of their strength or dexterity. Equally, because it allows the user to choose the degree of rotation to suit the particular application, it's adaptable to any number of markets and applications."

From a manufacturer's point of view, the fact that Rotite can be easily manufactured in numerous materials, is easily scalable, easily standardised and can be easily integrated into products with minimal tooling costs should make it very attractive. All these factors, claims Burns, make its widespread adoption across a range of sectors highly likely. "Rotite technology will revolutionise how we interact with everyday objects in the future due to its limitless derivatives and applications," he claims.

Although developed over a three-year period in conjunction with some of the UK's leading professionals in the fields of additive manufacturing and structural analysis, the idea was arrived at originally as Burns was looking

....in defence...

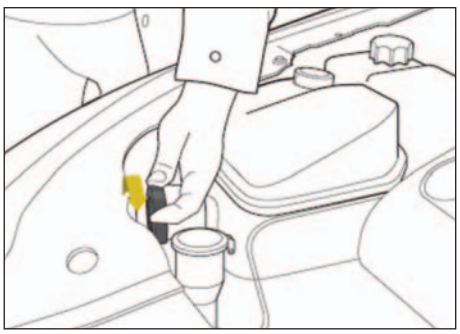
for a low-profile fastening system for textiles. He says: "I came up with the idea at 3am. I then 3D printed the first prototype. It didn't work, but by 5 O'Clock we had it." He was quick to realise his invention's potential far beyond the world of textiles. "I realised it had commercial value because, apart from anything else, nobody had done it before. It can attach any object to any object… you could even dock spaceships with it!"

3D printing has played a huge part in the development of the Rotite system. "Without 3D printing, we probably couldn't have 'discovered' the geometric principles that enabled us to develop the system. It has been the vehicle that has allowed us to take this step and our good contacts with the additive manufacturing community have proved absolutely invaluable to us."

Having developed the system and its variations, Burns then spent a year patenting it. "I had some great advice from an IP professional, who told me not to commercialise too early and to first get as much protection in place as I possibly can."

With this protection in place, the time has come for Rotite to find its markets. The most effective route to market, Burns believes, is via licensing the technology to companies who wish to manufacture products that use it. Thus far, he says, there has been interest from some big aerospace and automotive companies, while a leading product design company in London has expressed a desire to develop it in conjunction with Rotite. Says Burns: "Because Rotite is defined by a mathematical equation and has numerous forms, it is adaptable to any number of applications in any number of derivations. "

Currently, Rotite is planning a series of



...and automotive applications

demonstrations across the UK to display the advantages of the system. Says Burns: "It's so different to anything else out there that we've almost had to write a new language for the terminology we use to describe it. Even so, as soon as you show it to people, they get it. For that reason, we want to get it into the hands of every designer in Europe."

www.rotite.com

The Rotite system is claimed to offer almost "limitless" derivatives

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System solution with Rivtex

The Rivtex system solution from Arnold Umformtechnik and Arnold & Shinjo is a high-quality alternative to conventional welding. It cuts parts assembly costs whilst assuring every quality requirement.

With the Rivtex system studs and nuts are pressed into the ready-to-assemble sheet metal parts such that they do not fall out and are characterised by high twisting moments and press-out forces. The fastening process, controlled by intelligent tool technology, remains integrated in the press process and replaces at least one complete operation.

The Rivtex range includes clinch studs and self-piercing nuts designed to address requirements arising from steel and aluminium sheets less than 1mm thick. Rivtex fasteners cannot fall out because they are pressed firmly into the sheet metal component. With their large bonding area, RIVTEX fasteners are extremely stable against press-out forces and torque, and so develop their own safeguard against failure.

www.arnold-uk.com

Exotic material protects fuel pipe

Jet Press was approached by a major supplier to the European automotive industry to solve a novel fastening requirement.

The need was for a plastic clip to secure a fuel pipe where that clip was also capable of earthing the pipe as protection against electrostatic build-up. The solution developed and provided by Jet Press involved the use of carbon nanotubes (CNT). These are tube-shaped carbon cylinders, about one ten-thousandth of the thickness of human hair. When dispersed in the main polymer mix (in this case, impact modified Nylon 66) they allow any part moulded from this mix to demonstrate electrical conductive properties.

Getting the best from these modern materials required moulding techniques that had to be modified to make the part with a constant conductivity. Products manufactured in this way offer major advantages over other conductive solutions based on carbon black, carbon fibres or metals. They offer less risk of chemical contamination, homogeneous electrical conductivity at low loading, processing benefits, elimination of residual voltage hot spots, decreased weight of the final part, and retention of key mechanical properties.

In this particular application, a metal clip would risk damage to the fuel line and would need a secondary fixing to hold the clip in place. This solution was able to provide the customer with all the properties required at the lowest in-place cost.

www.jetpress.com

Trio treble strength of constructive bonding

tesa has announced the names of the products that make up the tesa ACXplus range – a future-oriented category of adhesive tapes for constructive bonding offering additional strengths to very specific types of application.

The range includes tesa ACXplus 705x, a powerful, invisible bonding solution for transparent and translucent materials, and tesa ACXplus 706x which provides excellent immediate adhesion on substrates with a lower surface energy, such as plastics and powder-coated materials. tesa ACXplus 707x completes the trio with long-term resistance against extreme temperatures and outstanding shock resistance (down to -40°C) in cold environments.

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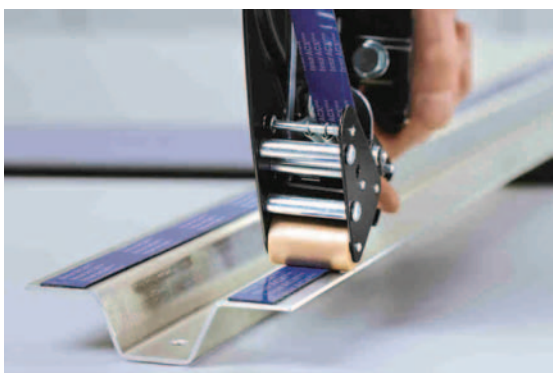

Air motors offer clear benefits

Air motors may be a little-appreciated technology, but one with distinct advantages, as Paul Fanning explains.

A Huco Dynatork air piston motor as used by oil and gas well services company Blue Manta

As with any technology, the advantages of air motors are more obvious in some applications than others. Even so, uses for them range from the food industry to medical and even nuclear power generation.

Air motors occupy a niche as far as power sources are concerned, being well-suited to those applications that require a compact, lightweight source of smooth, vibration-less power. Air motors stop and start almost instantly and provide extremely variable torque and speed without complicated controls. They can operate in hot, corrosive, and wet environments without damage, and are unaffected by continuous stalling or overload. In addition, they are instantly reversible and, unlike electric motors, run cool and start without shock, meaning there is no heat buildup and no electric sparks to damage the motor.

Because they are cooled constantly by injected air, air motors will generally not overheat even at high speed. This fact, in conjunction with the fact that they cannot burn out and do not produce electric sparks, means that air motors have long been a popular choice in environments where there is a danger of explosion. And, while explosion-proof electric motors are available, they are both considerably larger and more expensive than their air motor equivalents.

Air motors develop more horsepower per cubic centimetre than do most electric motors of standard design. An electric motor that develops the same horsepower as a typical rotary vane air motor (one of the two most widely used types of air motors) rated 2.5hp at 1,800rpm and 90psi, might be two to three times heavier. The low weight of air motors when compared to their electric equivalents makes them ideal for use in hand-held power tools or in robot end or arm applications, as well as any applications where easy changeover of the motor is necessary.

However, to compare air motors against electric motors purely on a power/size relationship does not do justice to one of the their key advantages: the relationship between torque and speed.

An air motor slows down when load increases. Its torque increases at the same time until it matches the load. The air motor continues to provide increased torque until it stalls, then maintains the stalled condition without harming the motor. As the load is reduced, an air motor increases speed and the torque decreases to match the reduced load. When the load is either increased or decreased, speed can be controlled by increasing or decreasing air pressure.

Equally, it is unhelpful to talk in terms purely of 'air motors', since there are different types suited to particular applications. Probably the best-known are rotary motion vane-type air motors. These are used to start large industrial diesel or natural gas engines.

Stored energy in the form of compressed air, enters the sealed motor chamber and exerts pressure against the vanes of a rotor. The rotating element is a slotted rotor mounted on a drive shaft. Each slot of the rotor is fitted with a freely sliding rectangular vane. The vanes are extended to the housing walls using springs, cam action, or air pressure, depending on the

motor design. Air is pumped through the motor input, which pushes on the vanes creating the rotational motion of the central shaft. Rotation speeds can vary between 100 and 25,000 rpm depending on several factors which include the amount of air pressure at the motor inlet and the diameter of the housing.

Piston-type air motors are designed withbetween two and six cylinders connected to the device's shaft. As air pressure acts upon the pistons, they move in alternating directions supplying rotating power to the motor shaft. Torque specifications of piston air motors depend on the amount of air pressure applied to the device, the number of cylinders, the size of each piston, the distance each piston moves within the motor body and the speed of the device. These kinds of air motors are useful in situations requiring high power and starting torque, and low speed accuracy.

Piston motors break down between radial and axial types. Radial air piston motors have a robust construction and are well-suited to continuous operation. They have the highest starting torque of any air motor and are particularly beneficial for applications such mining machinery and mine transport. Overlapping power impulses provide smooth torque. Sizes range from fractions of a kW to about 25kW at 4,500rpm.

Axial air piston motors are more compact than radial-piston motors,

Desoutter air motors are used in industries including textiles, marine, petrochemicals, food processing, printing and chemicals

making them ideal for mounting as starter motors for industrial diesel generators. Their design is more complex than vane motors, and they are grease lubricated. However, axial air piston motors are smoother in operation and can deliver maximum

Mannesmann Demag's MUD 23 air motor

power at much lower speeds. Smaller and lighter than electrical gear motors of the same power rating, axial-piston motors also tolerate higher ambient temperatures. Maximum size is about 4.5kW.

An instance where a piston motor was found to be more suitable than a rotary vane motor was with international oil and gas well services company Blue Manta. A bad experience with the reliability of a vane air motor prompted the company to look for a better-performing alternative. This type of motor is ideal for operation in ATEX environments, but the existing model was proving inefficient in extreme conditions, a problem exacerbated by its inaccessibility for repair and maintenance. Both were resolved when the company switched to a Huco Dynatork piston air motor.

Air motors are used by Blue Manta to tension cable as it is lowered into the well which can be offshore or in the desert. In both environments the efficiency of the vane motor was compromised by the extreme conditions. Its design makes it very difficult to seal, exposing the unit to the ingress of salt water and sand. By the same token air is lost to the atmosphere rather than being converted into motion.

The Huco Dynatork piston air motor, however, was immune to such problems. The operating principle of the product is simple. Via an integral rotary valve, air up to 100psi is supplied to each of three pistons in turn. The free floating pistons transmit torque on start-up that can be adjusted via a pressure regulator. This results in high torque at variable low speed.

As the motor traps the compressed air within the cylinder, maximum energy conversion is assured. The design is also easily sealable so not only does it consume up to 80% less air than its vane counterpart, it is also far more reliable in hostile environments. Equally, Huco Dynatork's piston motors' internal pneumatic porting makes them much less sensitive to temperature extremes and less prone to damage.

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From track to attack

Leading-edge motorsport technology is being adapted to create the next generation of defence vehicles. Laura Hopperton reports.

For the Armed Forces, technological advantage is – quite literally – a matter of life and death. And, while it used to be the case that where the military led, the civilian world followed, more than ever this is a trend that is reversing.

In 2007, the Motorsport Industry Association (MIA) established an initiative to help motorsport companies engage with the defence industry and maximise the business opportunities which existed between them.

The project, which has so far seen motorsport-derived radiators, charge coolers, gearboxes, brakes, suspension components and seals provide real benefit to defence vehicles on the front line, was first issued by Lord Drayson (then Minister for Procurement at the Ministry of Defence) and Lord Astor of Hever, Minister for Defence Equipment and Support in the House of Lords.

Both strong supporters of motorsport, Drayson and Astor spotted an opportunity for the advanced engineering skills involved in designing racing vehicles to be transferred into the defence arena. The current Government has also got on board, with Peter Luff, Minister for Defence Equipment, Support and Technology, hailing the success of the scheme during his speech at the MIA's Parliamentary Summer Reception last month. "I am pleased to say that defence is harnessing the technological strides being made in motorsport like never before," he commented. "There is no doubt in my mind that this initiative is saving lives."

One of the most high-profile projects borne out of the Motorsport to Defence initiative is that of Foxhound; a Light Protected Patrol Vehicle (LPPV) deployed to Afghanistan in June this year that came about as a result of a collaboration between Force Protection Europe and Ricardo.

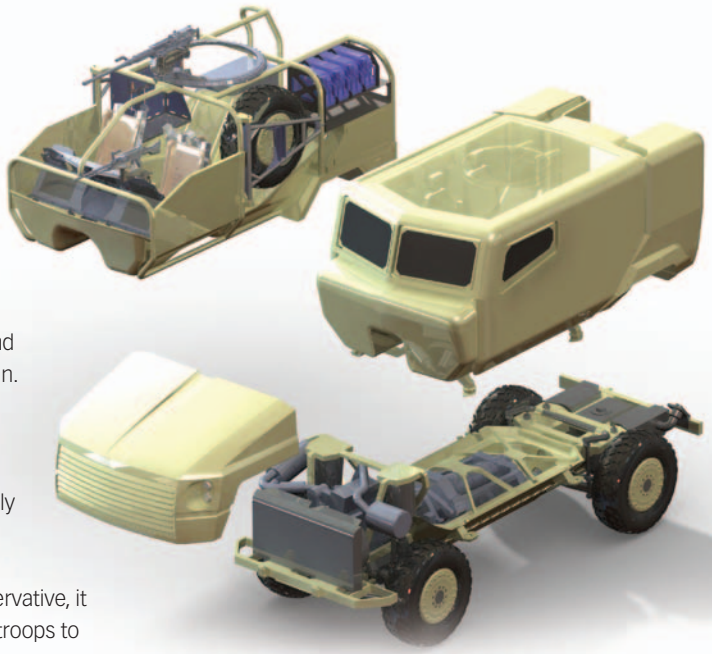
The UK-designed vehicle has been built to withstand direct strikes from improvised explosive devices (IEDs) and not only keep those inside safe, but be able to drive away on just three wheels. It has a V-shaped hull to help it survive explosions, an engine that can be removed and replaced in just 30 minutes, and a pod designed by an ex-Formula One design engineer that makes use of materials more commonly found on the Grand Prix circuit.

Elsewhere, Lifeline Fire & Safety Systems provided the innovative fire suppression systems to the engine and internal compartment, while BMW engineers helped outfit Foxhound with speed capabilities up to 70mph.

"Foxhound is an amazingly agile piece of kit," noted Chris Aylett, chief executive of the MIA. "We have also had similar success with other MIA members on important projects. Specialist brake and clutch manufacturer, Alcon Components, has also used its extensive motorsport experience to provide brakes for an upgraded Jackal armoured vehicle, while engine cooling specialist, NAR Group, has drawn on its Paris-Dakar experience to design a new dust proof cooling system for the Army's Panther, Mastiff and Ridgeback vehicles.

"Foxhound is an amazingly agile piece of kit"
Chris Aylett, President, Motorsport Industry Association

While the defence industry had reservations at first about whether technology from the motorsport world could be transferred, Aylett says it soon realised the numerous similarities between motor racing and the battlefield. "Both compete over variable terrain, experience



extremes of temperature and adverse climatic conditions and both require high levels of protection," he commented. "The driving force behind the engineering output is also the same; warfare. The Formula One engineers working to make sure the blue car wins over the red car are working in the same envelope as those developing technology in defence trying to win wars.

"Both have urgent operational requirements in terms of speed and safety. If Jenson Button comes off the track and says to us 'this needs to be changed', we need to change it, and fast. Likewise, in the defence arena, engineering solutions need to be delivered quickly to help vehicles get in and out of difficult situations. It's not of case of 'wouldn't it be nice to have air conditioning', the reality is that if we don't do 'X', someone could get killed."

Another success story of the Motorsport to Defence initiative is the Supacat SPV400, which combines an integrated blast and ballistic protection system, including a protected all composite crew pod and again utilising a V-shaped hull. Using the latest composite and ceramic armour systems, the crew pod is constructed as a separate module, sealed off from potential secondary projectiles, such as kit and electronic devices, which are housed in a rear compartment. All seats are also mine blast-protected.

One interesting aspect of the Supacat's design is that it employs high and low range gears from Xtrac, a leading designer and manufacturer of high-technology gearboxes, differentials and driveline components. These can be actuated whilst the vehicle is on the move, enabling rapid transfer between on-road and more extreme off-road terrain. The transfer case centre differential provides a 50:50 torque split to the front and rear axles and is electronically controlled.

"While the military has historically been quite conservative, it is now interested in getting troops to theatre quickly. It also wants more open wheel vehicles, which is good because it has more of a synergy with motorsport," says Xtrac's chief engineer, Martin Halley. "There's a lot of parallel engineering between both sectors in that the race starts whether you're present or not and the war is still on regardless. You have to deliver a robust, reliable vehicle and it has to be ready for action by a particular date."

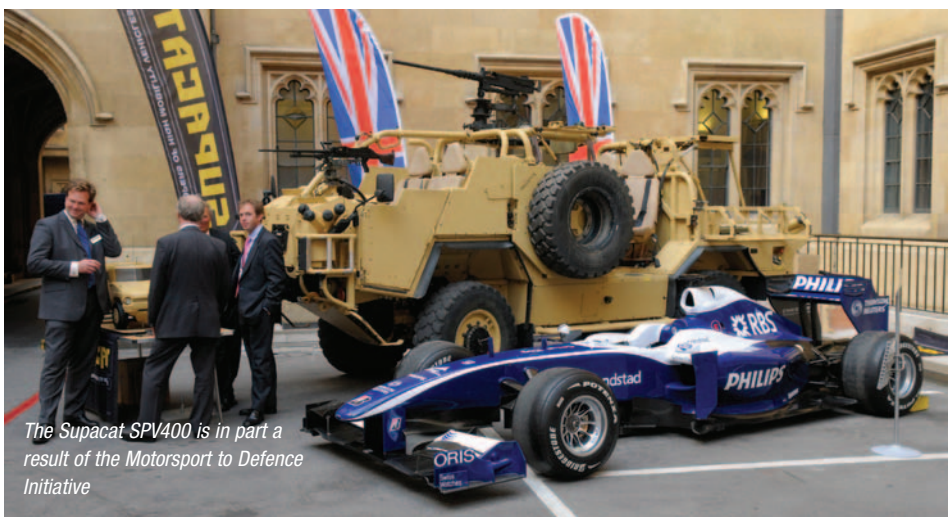
"There's a lot of parallel engineering between both sectors"
Martin Halley, Xtrac

Aylett concurs: "This sense of immediacy wasn't being utilised before, but the military is starting to integrate ideas into industry to improve lead times and adapt to the ever-changing challenges warfare presents. Before the project was established, we had two world class sectors in the UK that hadn't recognised each other's value before. It makes you wonder how many more there are out there. We were surprised to find that rather than being filled with regulation, the defence industry was quite open to new ideas if they had the possibility to save a life."

While both Aylett and Halley admit that cost is a challenge, they believe the 'flash to bang' approach of the project has so far been a huge success. "The stunning thing is that we're only in chapter one of this relationship," Aylett noted. "The amount of ground that's been covered in such a short timeframe comes down to the incredible work done by engineers."

MP Peter Luff concludes: "Shared access to leading edge, high performance engineering will no doubt bring direct benefit back into defence. And the project – just like the broader motorsport industry – is energising interest in science, technology, engineering and mathematics in our young people. It is sparking the imagination of the next generation of engineers and scientists. Some of them will, in future, be responsible for winning championships and boosting our economy. But some of them will be responsible for winning wars."

www.the-mia.com
www.xtrac.com



The Supacat SPV400 is in part a result of the Motorsport to Defence Initiative

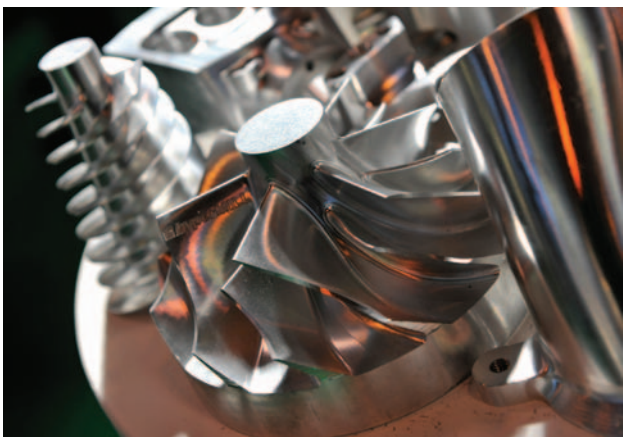
Rapid progress at TCT Live

With the latest information about additive manufacturing and 3D printing, TCT Live 2012 promises a great deal for visitors.

TCT Live 2012, which takes place from the 25th-26th September at the National Exhibition Centre, Birmingham, is a key event for those involved in additive manufacturing and 3D printing.

It is an ideal forum for everyone involved in the concept, design, specification and manufacturing process to learn about the latest developments in additive manufacturing, 3D printing and other cutting-edge product development software and technology. For anyone whose role involves accelerating time to market, reducing cost and improving efficiency, TCT Live promises to deliver a valuable return on time invested visiting the show.

The exclusive focus on product development, additive manufacturing and 3D printing technologies gives TCT Live huge value in terms of learning about new technologies and how to adopt them into business. Whatever the level of knowledge of the individual visitor, TCT Live will further their product development skills.



Designers, prototype specialists, technical directors, development engineers, product managers, design directors, chief engineers, sub-contractors and consultants all attend TCT Live searching for the latest technologies to help them reduce time to market.

On the showfloor, TCT Live will play host to over 200 exhibiting companies aiming to showcase the most innovative and dynamic technologies available on the market. With a focus on live machine demonstrations, technologies on display include additive manufacturing, 3D printing, inspection, metrology, material suppliers, prototyping specialists, software and CAD/CAM/PLM.

Alongside the exhibition is the Additive Manufacturing and 3D Printing Conference, featuring some of the leading industrial and academic experts in this sector. Once viewed as a niche area of product development and manufacturing, the AM and 3D printing sector has escalated significantly in the last 12 months, with global awareness of the processes increasing at an unprecedented rate. With the prolific number of headlines though, there comes an inevitable amount of hype and this is where the TCT Live AM & 3DP Conference comes into its own. Anyone who registers to attend this free annual conference will be confronted with the truth about additive manufacturing and 3D printing – what it can do, and, indeed, what it is doing in the real world within industry and the creative sectors.

Throughout the two days, the conference programme will explore the impact and applications of both AM and 3DP. Providing diversity and valuable, practical information, this line-up has been designed to appeal to a wide audience, whether they have been introduced to the technologies previously or are being introduced to them for the first time. Presentations will cover a number of specific business applications of AM and 3DP as well some of the latest developments across the industry.

Featuring an impressive array of speakers, TCT Live 2012 is a good event for networking with industrial and creative users of additive technologies. The speaker roll-call includes Todd Grimm, T.A. Grimm & Associates; Phill Dickens, Professor of Manufacturing Technology at Loughborough University; Paul Doe, lead engineer at Prodrive BMW Mini Team; Sean Horning, Project Engineer,

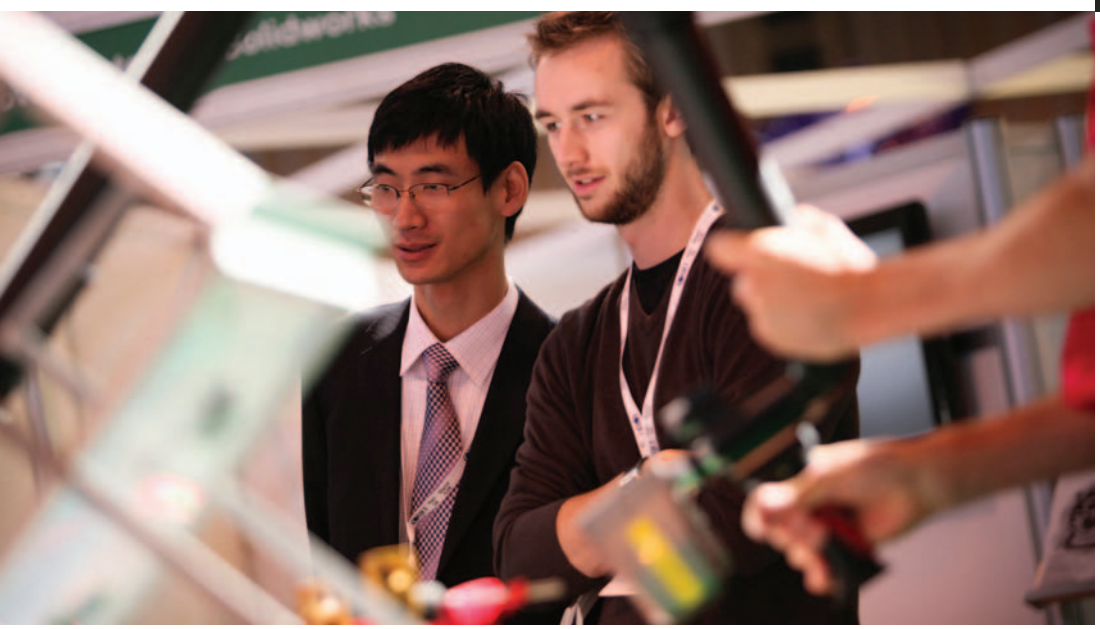
Burton Snowboards; Stuart Burns, Technical Director, Rotite Technologies; Anthony Reeves, lead engineer, GlaxoSmithKline; and Dan Johns, process and technologies engineer, Bloodhound SSC; plus many more.

This year also sees the introduction of a dedicated jewellery session looking at how additive manufacturing and 3D printing processes are being utilised in this innovative sector. This session gives jewellery designers, manufacturers and silversmiths the ideal opportunity to hear how their peers are already reaping the benefits and enhancing their designs. This year will also provide attendees with clear insight into the latest additive manufacturing developments with gold. Within this conference session speakers include Joerg Fischer-Buehner, Legor Group SpA; Mark Bloomfield, Electrobloom; Luke Orford, Grant Macdonald; Silvia Weidenbach, Weidenbach; and Lena Thorsson from Cookson Precious Metals.

TCT Live also offers a huge range of free live educational seminars. Spanning the two days the TCT Technology Tracks include: Inspection, Digitising and Metrology in Product Development and Additive Manufacturing — with case studies and interactive demonstrations this seminar takes visitors through the full spectrum of equipment available; Additive Technology Introduction Session — presented by industry 'guru' Graham Tromans, this back-to-basics seminar gives newcomers to the industry an overview of additive manufacturing technologies and explains how businesses can take advantage to advance their product development and manufacturing processes; Digital Manufacturing and Materials for Dentistry — looks at the impressive advances in technology suitable for dentistry as more and more laboratories recognise the advantages of incorporating cutting-edge techniques into their process; Software in Product Development and Additive Manufacturing — ideal for visitors wishing to maximise the potential of their product development software, with an in-depth look at some of the leading CAD/CAM/PLM software currently available in the marketplace; and Technical Briefings in Metals and Non-Metals, ideal for anyone looking to source and purchase 3D Printing or additive manufacturing machinery.

www.tctshow.com

Technologies on display at TCT Live will include additive manufacturing, 3D printing, inspection, metrology, material suppliers, prototyping specialists, software and CAD/CAM/PLM

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IP: The China Syndrome

Eureka has partnered with leading intellectual property law firm D Young & Co LLP to offer guidance to companies on how to protect their IP. In this issue, D Young partner Anthony Albutt looks at ways to develop an IP strategy to target China.

It is a fact of business that if a product sells, there's every chance someone will imitate it. Intellectual Property Rights (IPRs) are available in law to prevent the exploitation of technology, brands and designs without permission of the proprietor. But what if imitation is happening abroad? And, specifically, what if it is happening in China, where a substantial amount of manufacturing takes place?

China has developed at an incredible rate and while in the early days IPRs were either non-existent or completely ignored, things are now very different. So, what do you need to know about intellectual property and China?

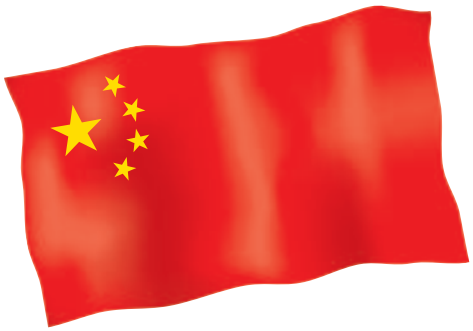
The Basics

Fundamentally the protection available to a foreign company is the same as it is in the UK and other industrial countries. You can protect technical features (with patents), aesthetics (with designs) and brands (with trademarks). The legal requirements for patents, trademarks and designs are also largely the same or similar. For example, to get a granted patent in China your invention must be new (novel) and not be obvious to a person skilled in the field of the invention (inventive). Chinese patent law is in fact based on the law of the European Patent Office and, although over time there has been some divergence, the laws remain largely the same.

The Framework

The legal profession has de-centralised in China and there is now an abundance of law firms of varying size but also quality. Selecting a prominent firm in a major city is a good start. Good English skills are essential since this minimises the chances of technical issues and arguments being 'lost in translation' and costs increasing. Costs can often be minimised by recycling amendments and arguments which have been used in other countries. As mentioned above, the basics are the same and similar objections frequently arise at different patent offices. A way to control costs is to be realistic about the scope of protection you actually commercially need. If you try to secure very broad protection, you can expect more objections. This applies in any jurisdiction.

"The common misconception is that there is an international patent – there isn't"



Typical Patent Strategies

Typically, companies first file a UK patent to protect their domestic market. Then, 12 months later an international application (stemming from the UK) is filed designating most industrial countries. This keeps all options open. The common misconception that there is an international patent – there isn't; an international application is a means to select countries at a later date. At 30 months from the UK filing you select your countries for national rights, in our case China. You then commence your dialogue with the Chinese patent office and eventually a patent is granted.

Enforcement

There was a time when obtaining an injunction or damages against a Chinese company, in China, was almost impossible. Again, things have changed substantially. A good tactic is to select a court away from the infringer to a more 'neutral' court. This is a good way to ensure your case is dealt with without any possible bias of local officials, a common complaint of litigants in China.

Opportunities

Remember China is a commercial market and your IPRs are a commercial tool. You can licence and sell your IP even if you don't operate there yourself. It may well be better to do a sound deal on a licence than enforcing your rights or perhaps allowing infringement to continue un-checked. With a population in excess of 1 billion, even a small royalty can generate a considerable income.

The future of manufacturing in China

Labour costs in China are increasing as standards of living rise and that removes the edge that China has enjoyed for many years. Manufacturing in the UK may well become more appealing, particularly if products can be designed to minimise labour costs. This keeps technology, 'know-how' and jobs in the UK and reduces transport costs. A richer China will also consume more. China might thus convert from an exporter to an importer of your products. Irrespective of where you manufacture, if China is a mass market for your products, maintaining IPRs there becomes very important.

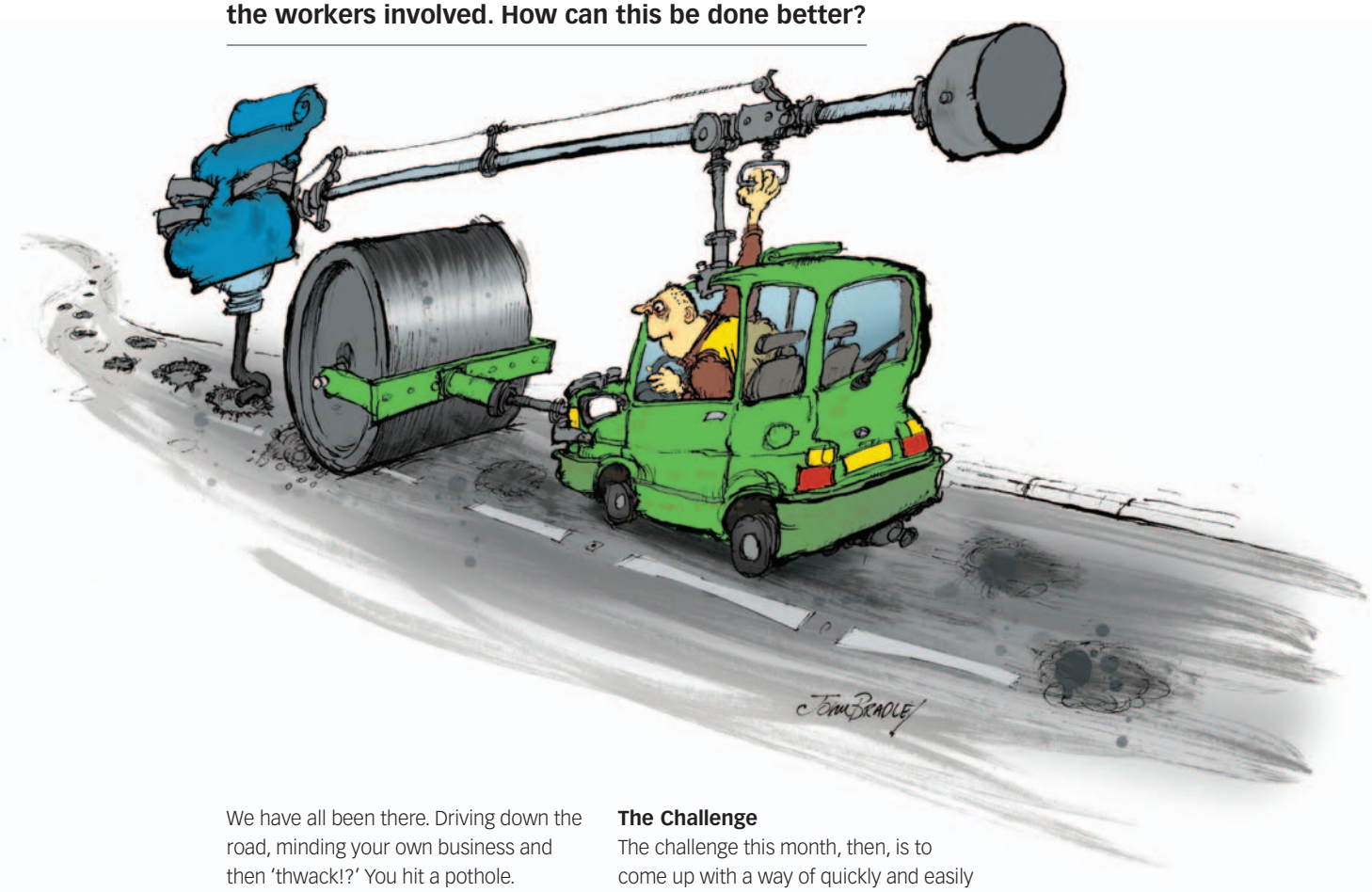
Conclusion

Intellectual property protection should be an important aspect of any company's strategy. You might decide IPRsy are not commercially needed, but they should at the very least be reviewed. It is important to recognise that IPRs are not just an insurance policy to protect your company's brand and innovation; IPRs also offer you a commercial opportunity. It is a global market for UK companies and IPRs offer innovative companies the chance to secure income in different jurisdictions either by using them to protect your own sales or by licensing others to use your brand, design or technology.

For more information, please contact Anthony Albutt, Partner, on:
Tel: 020 7269 8550 Email: aja@dyoung.co.uk
www.dyoung.com.

Tackling cracks head on

Filling cracks in the road can be both hazardous and time consuming to the workers involved. How can this be done better?



We have all been there. Driving down the road, minding your own business and then 'thwack!?' You hit a pothole. Depending on where you live and how much the road is used, it might be there for a few hours or a few years.

Potholes are caused by cracks forming in the road, into which water seeps and then freezes. As the water expands, this pushes the top layer of tarmac up and creates a hole. The trouble is it usually has to turn into a relatively large problem before anyone fixes it. And when potholes are fixed, it can be a time consuming, and dangerous process, with workers having to work alongside fast-moving vehicles.

It is estimated that poor roads cost British motorists £2.8 billion every year in burst tyres and suspension damage, with authorities paying out £50 million every year to the motorist as compensation for poor road maintenance.

The Challenge

The challenge this month, then, is to come up with a way of quickly and easily repairing road cracks before they spread in to something worse. Your device should be easily operated, with minimal personnel and be able to cover a lot of road per day.

Unless you have an inspiring leader and take a leaf out of the film 'Cool Hand Luke', it is unlikely road resurfacing productivity can be increased using people alone. Therefore the solution should be an automated systems mounted or integrated within a vehicle. However, the object of the exercise is also to make this a cost effective process so simplicity, and off-the-shelf components are a must.

The key to success is likely to be the speed at which a crack can be detected and then filled, so manually identifying the holes is a far from the ideal solution. While a purpose-built vehicle might be optimal, remember to keep costs down and make any device easy to deploy and at a relatively low cost to councils.

The solution is surprisingly elegant and is largely an integration exercise involving an array of sensors and some clever software to allow it to be deployed on the move. When you see the solution, you may consider it obvious. In the meantime, see if you can come up with anything better.

The solution to last month's Coffee Time Challenge of how to safely and quickly strip electrical cable can be found in the Technology briefs section on page 10

Adhesives

Radically Improved Instant Adhesive

Loctite 3090 is a clear, two-part cyanoacrylate that increases the versatility of instant adhesives. Alongside traditional benefits, 3090 allows exposed adhesive outside of the joint to harden within minutes – removing the need for a post-assembly activator. Gap sizes up to 5mm are readily accommodated and the gel viscosity means it's suitable for vertical or overhead application.

It can be used on plastic, rubber, wood, stone, leather, fabric or metal and can withstand a force of 20N/mm². Easy to use, 3090 comes in a pack containing a dual syringe with seven mixer nozzles – and no application gun is required.

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

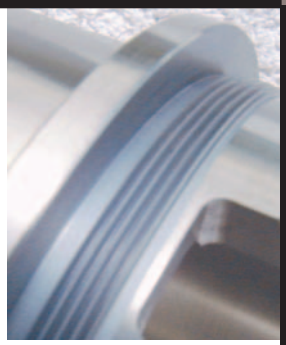
www.loctite.co.uk/3090

Adhesive Tapes

www.tesa.co.uk

Coatings

WS2 Stops galling of SS and Titanium



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

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

Design Out maintenance problems with WS2!

@: sales@ws2.co.uk
✆: 01430 861222

www.ws2.co.uk

Courses

Sapa Profile Academy: An advanced course on design options with aluminium profiles

6-7th November, Cheltenham Gloucestershire, and Redditch Worcestershire, UK.

Aluminium over the last decade has become an increasingly more popular material to use in various applications and product solutions, yet the knowledge of aluminium and profile construction is still low compared to more traditional materials. Sapa has therefore developed the Profile Academy, an educational experience that helps to raise the skill levels of designers and engineers also giving your company a unique competitive advantage in the market.

Over two days attendees will meet Sapa experts, together with qualified lecturers, in an advanced course designed to demonstrate opportunities with aluminium.

@: sapa@shawandunderwood.co.uk
✆: (0)1773 872761

www.sapagroup.com/uk/profiles

Finite Element Analysis (FEA)

www.idac.co.uk

Pumps

Jabsco and Rule Innovation products from Xylem Flow Control keep over 7 million leisure boats afloat annually

Rule Mate 1100

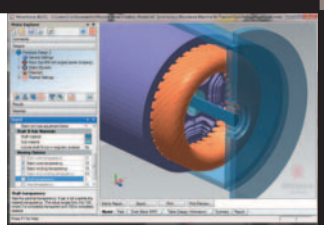
Number one in the marine market, leading global water technology provider Xylem's Jabsco products include water systems, engine cooling pumps, searchlights and waste systems. Xylem's Rule brand is a leader in submersible bilge and utility pumps for recreational and small commercial boats and marine accessory products. The eco-friendly Rule Mate series features water sensing technology for automatic switch on, pump out and switch off with no float switch required. To prevent harmful discharge into the marine environment, the pump will not switch on if oil is detected in the bilge. Powered by a variable speed drive, the Jabsco V-FLO pump constantly monitors water flow and electrical current and automatically adjusts itself to keep systems operating at peak efficiency. Revolutionary new DiMOND technology automatically detects common failures - if a problem is found, the pump stops operating and provides the data required to solve the problem.

@: www.xylemflowcontrol.com/contact-us/
✆: +44 (0)1992 450145

www.xylemflowcontrol.com/flojet

Software

Infolytica releases MotorSolve 4.0



MotorSolve is the modern electric motor design software combining classical design techniques for the initial sizing, with automated FEA simulations for accurate performance prediction of BLDC, SRM and IM motors. The extensive set of standard rotor and stator templates make changes to parameters simple, and can be reviewed easily with the advanced built-in design history feature.

MotorSolve Thermal also evaluates the impact of temperature and different cooling methods on the machine's performance. Using the same software and the same motor model, Designers can calculate flux linkage, efficiency plus temperature in each component.

@: sales@infolytica.co.uk
✆: +44 (0)1327 810383

www.infolytica.co.uk

SQDC

Harsh Environment Quick Disconnects speed Test Hook-up

Designed to speed up gas turbine data acquisition, Chell's SQDC is fully tested from -50 to 325 degC and, with its built-in locking device, for vibration to D0160F.

Available in 4, 8, 16,19, 24 & 32 way circular configurations for 1/16th inch and 1mm OD tubulation, SQDC's may be specified with Silicon or Perlast seals, pressure-tight blanks and pipework guides.

Used in conjunction with ESP pressure scanners and Chell's microDaq, data acquisition of multiple pressures has never been faster or more convenient.

@: info@chell.co.uk
✆: 01692 500555

www.chell.co.uk

Mechanical Design Engineer

Location: Yorkshire
Type: Permanent
Salary/Rate: £60k per annum, plus benefits

We are looking for experienced mechanical design engineers to join our team, designing and developing bespoke mechanical handling and lifting equipment.

Essential Skills:

- Strong mechanical design experience
- Experience designing mechanical handling or lifting equipment
- Experience with AutoCAD, SolidWorks or Inventor.

You will be responsible for the mechanical design and development of bespoke lifting and mechanical handling equipment, in line with LOLER and Machine Directive regulations. You will also be responsible for supporting sales with technical documentation, interfacing with clients and produce all supporting technical documents.

For full details online, enter reference: qkC0Xzf

Senior & Lead Mechanical Engineers

Location: South West England
Type: Permanent
Salary/Rate: £35k-£55k per annum, DOE

This market leader in the fields of defence and nuclear engineering is looking for senior and lead mechanical engineering talent.

As integral members of the mechanical team, candidates would be expected to perform work involving considerable independence in approach, demanding originality, ingenuity and judgement. The individuals will make key technical decisions and are expected to 'own' all aspects of their design. Ideally, you will be a member of a relevant institution and hold Chartered or Incorporated status.

Your work will involve the planning, design and delivery of complex defence systems equipment. You may be requested to undertake concept or detailed design, dependent upon the maturity of the projects underway.

Successful applicants will need to satisfy UK Ministry of Defence security requirements.

For full details online, enter reference: qkC0Xs8

Mechanical Engineer

Location: Midlands
Type: Contract
Salary/Rate: Excellent rate

This global rail company requires a Mechanical Engineer to join its project immediately on an initial 6-month contract, with a view to this being extended.

Requirements:

Ideal candidates will have a strong mechanical engineering background and experience of working in the rail industry. You'll need to be familiar with working to various industry codes and standards. You'll be involved with:

- Design review and sign-off
- Tendering
- Costing
- Technical report
- Specification
- Acceptance
- Project delivery
- Providing engineering-based solutions.

For full details online, enter reference: qkCzz3D

Mechanical Design Engineer

Location: Northwest and Midlands
Type: Contract
Salary/Rate: By negotiation

Mechanical Design Engineers are sought who will specify, design and develop mechanical plant and equipment for defence projects.

Candidates should have a strong focus on delivery to quality, cost and time, within a process-driven environment, be self-starters and able to work as individuals or as part of a team. You will capture task requirements and translate these into design intent. You will be responsible for the detailed design and specification of mechanical components and equipment, including welded/fabricated structures.

You will underpin these designs by conducting stress analyses, thermal analysis, fatigue and fracture analyses, and also by documenting FMECA workshops, with involvement from other engineers. You will produce design substantiation reports to demonstrate that safety functional requirements are met, etc.

For full details online, enter reference: qkC0BQ3

Performance Engineer

Location: Bristol, Somerset
Type: Permanent
Salary/Rate: By negotiation

An experienced engineer is sought to work in this leading company's aerospace business unit.

Requirements:

- Trending of pass-off data, with appropriate reports
- Producing pre-test & post-test engine models
- Developing engine performance models
- Data generation from engine performance models
- Produce and test customer models; Statistical calibration of test facilities; Test data analysis and feedback into relevant engineering departments
- Incident investigation analysis (root cause investigative support) & support to customer queries
- Engine Management Plan/Life Management Plan & Technical life Review support
- Writing engineering specifications from customer requirements
- Report major issues and programme status to management
- Excellent communication skills etc

Opportunities to gain project management experience in an international work environment.

For full details online, enter reference: qkC0Moy

Mechanical CAD Design Engineer

Location: Newport
Type: Permanent
Salary/Rate: £35-45k per annum, plus benefits

This major player in the defence sector, specialising in military communications, C4I systems, avionics and aerospace, is a leading prime contractor and complex systems integrator, working in partnership with the MoD.

Description of Programme
Mechanical CAD Design Engineer, reporting to Vetronic Hardware Design & Installation Lead. Mechanical engineering tasks within multi-disciplined project teams for the installation design of platform subsystems. Responsible for the mechanical design solutions within the electronic architecture team, including concepting, packaging and platform installation design. Mechanical design during all phases of the development lifecycle. Responsible for mechanical specifications and analysis of design solutions to meet requirements.

Essential requirements: ideally land platform experience, and working knowledge of ProE and PDM toolset, 3D CAD packages and BoM structures. BS8888 design practices etc.

For full details online, enter reference: qkC0ZwF

R&D Engineering Manager - Offshore Wind

Location: City, London
Type: Permanent
Salary/Rate: By negotiation

Are you an experienced R & D Engineering professional, who has worked on Renewable Energy projects? Can you think creatively, working with technical experts from different countries? Do you have a science background? If so, EDF wants to hear from you.

EDF's R&D UK Centre was established to support the business and prepare for the future. The UK is a very dynamic environment for R&D and innovation in energy, especially Offshore Renewable Energies. In recognition of this, the UK Centre leads the R&D Offshore Wind project from the UK on behalf of the EDF Group.

The role is to develop and manage the EDF R&D offshore wind project to contribute towards the realisation of the group's ambitions in this area.

For full details online, enter reference: qkC0MYN

Mechanical Engineer

Location: Wales
Type: Contract
Salary/Rate: By negotiation

This company, world-renowned in the aerospace sector, requires multiple Mechanical Engineers to work on a contract basis for a minimum of 12 months.

The ideal engineer will possess strong Catia V5 experience, preferably with a background gained in the automotive or aerospace sector.

The company, based in South Wales, is at the start of a significant transformation programme, leading to many additional opportunities coming up in the near future.

Any VPM experience is of great interest.

For full details online, enter reference: qkC0WSD

cube67+ – THE PLUS FOR ADDED FLEXIBILITY

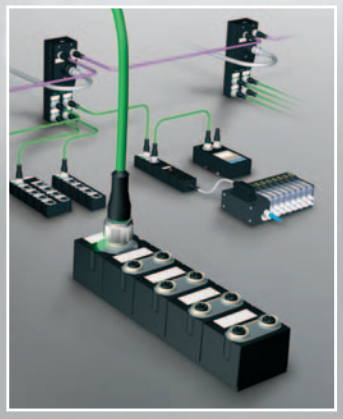
The next generation

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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Swinton, Manchester, GB
M27 4FG

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