GPS for the Milky Way

Electric motors play a key role in the MOONS project

EMS FAULHABER

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Understanding the impact of the availability heuristic...

A friend was telling me a joke: “This bloke walks into a pub,” he began, but to be honest I zoned out almost immediately. All I could think was, well – who is this bloke? Have I ever met him? What’s he like? I’m guessing, by the time he spends at the pub, that he’s got a bit of a drink problem. And I know he’s not a well man because he’s always at the doctor’s. Eventually I zoned back in to find my friend looking at me expectantly. I made an effort to laugh politely, but the way he stomped off made me wonder if perhaps the conversation had moved on a bit further than I thought, and I’d just laughed at something entirely inappropriate.

I mention all this because I’ve noticed of late that I’m being bombarded by increasing numbers of supposed facts – primarily Brexit related – all prefaced with the words ‘they say’. But who are these mysterious ‘they’? Do they have any real inside knowledge or qualifications to make their own statements more worthy than anybody else’s, and if so why don’t they reveal themselves? It’s one thing to quote general sources for public opinion – the man on the Clapham omnibus and Disgusted of Tunbridge Wells spring immediately to mind – but quite another to cite ‘facts’ without ever checking their legitimacy. Or does adding the preface ‘they say’ free the orator from any responsibility to verify the content?

Now, perhaps deep down we all acknowledge that when we start a sentence with ‘they say’, really we know that we’re just passing on hearsay, but it’s often an interesting way to open up a debate. There’s a problem, however, and it has to do with a phenomenon called the ‘availability heuristic’, and it’s how we tend to make decisions as human beings. The availability heuristic is a mental shortcut that associates the greatest importance to the things that can be most readily recalled. If something can’t be recalled easily, then it can’t be as important as something which can. Where that becomes key as part of the ‘they say’ discussion is when we consider that the easiest thing to recall is frequently the last thing we heard, so in effect the implication of the availability heuristic is that we tend to be most influenced by the most recent piece of information, regardless of the reliability (or otherwise) of the source.

It seems to me that politicians make use of the availability heuristic all the time: answering a direct question with a response that does actually address the question tends to be less important than simply ensuring you have the last word on the matter. And while putting out phrases and slogans that are blatantly misleading – plastering £350m across the side of a bus, for example – may in the long term come back to haunt you, in the short term they play to mental processes that are influenced by the availability heuristic, and they rely on the tendency of people to pass off any statement as fact by prefacing it with ‘they say’.

As we lurch toward October and the increasing likelihood of a ‘no deal’ Brexit, I’m braced and ready for a deluge of authoritative-sounding statements on how good or bad (depending on your point of view) things are going to be. Fortunately, none of the uncertainty in the meantime is having any impact on the economy. Or so they say.

Mark Simms
Editor
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UK needs a culture of innovation to take its own giant leap forward

The celebrations of the moon landing highlight how innovative thinking can drive us forward to new technologies and solutions. Mark Simms asks if there is enough support for the UK’s innovators

As someone who was just old enough to remember the moon landing in 1969, I have very much enjoyed the 50th anniversary celebrations and commemorations. Certainly it was a mighty achievement by NASA, and a heroic effort from the three astronauts – Neil Armstrong, Buzz Aldrin and Michael Collins. Given how calm they were under such immense pressure, it is easy to see how the description of ‘the right stuff’ came to be coined.

Much has been written about the design of the spacecraft, and the glory of course goes to NASA. What is less well known is the vital contribution of British engineering to the mission, as regular Industrial Technology contributor Ian Allman reminded me. Indeed, without the technical ingenuity of an Englishman, the mission might not have happened at all. Tim Bacon, credited with bringing to market a practical version of a fuel cell first demonstrated by Sir William Robert Grove in 1839, was told by US President Nixon: “Without you Tom, we wouldn’t have gone to the moon.” Bacon developed Grove’s fuel cell concept to use activated nickel electrodes with an aqueous potassium hydroxide electrolyte. In January 1940, he moved to a laboratory at King’s College London and there developed a double cell, with one unit for generating the hydrogen and oxygen gases and the other for the fuel cell proper.

This could be reversed so that it acted as both an electrolysers and a fuel cell. Problems were encountered due to the high operating temperatures and pressures and the corrosive nature of the chemicals.

In 1946, under new funding arrangements, the work moved to the Department of Colloid Science at Cambridge University. There Bacon’s team were shown a sample of porous nickel sheet whose origins were so obscure they were protected by the Official Secrets Act. They used this sheet to develop electrodes with large pores on the gas side and finer ones on the electrolyte side, which created a much more stable interface than had existed previously.

As funding levels increased the apparatus was moved again to what was then the Department of Chemical Engineering. There the team overcame problems of corrosion of the oxygen electrode by soaking the new nickel electrodes in lithium hydroxide solution followed by drying and heating. In 1959, with support from Marshall of Cambridge (later Marshall Aerospace) a 5kW forty-cell battery, with an operating efficiency of 60%, was demonstrated publicly.

The patents for the fuel cell were licensed by Pratt and Whitney as part of a successful bid to provide electrical power for Project Apollo. The fuel cells were ideal in this regard because they have rising efficiency with decreasing load, unlike heat engines. Hydrogen and oxygen gases were already on board the ship for propulsion and life support, and the by-product water could be used for drinking and humidifying the atmosphere of the capsule. A further by-product was heat which the crew used to keep warm.

50 years on, and British innovation remains key to developments in space technology. We need look no further than the likes of Reaction Engines and its SABRE rocket engine, or the likes of Surrey Satellite Technology which is at the forefront of the UK’s effort to grab 10% of the global space market.

British innovation extends well beyond that single field, but doesn’t always get the recognition – and certainly doesn’t get the funding and support – that it warrants. Mr Allman said: “There are literally 100s of British people with creative, useful ideas that the country could make good use of. It is one thing that we seem to excel at without any difficulties. Sadly, as usual we don’t make the best of our natural aptitude. However, because of what we are going to go through as a nation in the coming months, I think we had better start thinking of doing so for the benefit and well being of everyone in the country.

“Innovation and inventing must become the flavour of the future. I think we will need it.”

We can, and should, think further, too, and look beyond just developing innovative products and technologies to the way in which we use technologies to enhance platforms and processes. Greater adoption of technology could unlock productivity and wage growth. Research shows that more adoption, coupled with better management practices, could add £100 billion to the UK economy and cut income inequality by 5%. However, only 54% of UK companies believe disruptive technologies play an important role in their organisation, much lower than in other countries.

Since the 2008 financial crisis, UK productivity growth has slowed considerably compared to many G7 competitors, with key sectors such as financial services and construction experiencing negative growth. At the same time, a productivity and prosperity gap is opening up between companies willing to invest in the latest technologies and those that are not.

Research from the CBI and Oracle highlights that larger companies – which account for 48% of UK turnover and employ 40% of its workforce – are especially struggling to digitally transform. They face a range of issues including skills scarcity, complex legacy systems and a 25% greater threat from cyber attacks compared to other companies. By contrast, smaller start-up companies are more likely to adopt new technologies, while firms aged over 15 years are the least likely.

Felicity Burch, CBI director of digital and innovation, said: “No business can rest on its laurels when it comes to technology. Big firms must be doing all they can to stay ahead of international competitors and adopt new technologies that will boost productivity and efficiency. Many will assume that, with the resources at their disposal, it’s easy for large firms to adopt new technology. But a host of challenges, from ageing legacy systems, cyber security threats and agile new challenger firms can make successful innovation feel like hitting a moving target.

“For the UK’s big hitters to secure their position as world leaders over the next 10 years, senior business leaders must be prepared to challenge their established ways of operating and cultivate an environment that encourages employees to seek innovative solutions.
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Big investment sees Analog Devices open bespoke UK HQ

Analog Devices, a global manufacturer of semiconductor-based technology solutions and systems, has opened the doors of its new headquarters office in Hayes, London, a location which will strengthen its ability to connect customers with the best engineering talent in the UK and overseas.

By locating its new office in London, close to a fast Elizabeth Line link to the city centre, Analog Devices has made itself accessible to the capital’s huge pool of talent – not only software and hardware engineers, but also a vibrant community of entrepreneurs and start-up workers, as well as skilled staff in non-engineering disciplines.

Close to Heathrow airport, the new HQ office is also a convenient hub for the company’s domain specialists located in other Analog Devices locations such as Munich, Germany, Boston, US and Limerick, Ireland. These technology and applications experts will now more easily be able to take part in UK customer meetings hosted by Analog Devices.

The new office, which has a distinctly contemporary look, underpins Analog Devices’ ambitious plans for growth in the UK. It easily accommodates all the staff who previously worked at Analog Devices and legacy Linear Technology offices in Weybridge and Marlow, with a generous additional floating capacity to accommodate customer meetings, visits by field engineers, training facilities and an expanding staff headcount.

The site of the new office used to be a vinyl record factory at which discs from the likes of the Beatles and Rolling Stones were once pressed – a link to the UK’s long audio engineering heritage which is mirrored in the decoration of the new office. Mike Bricthfield, Analog Devices’ European vice president of sales, said: “Our new UK office beautifully combines the past and the future – the site’s history as a record factory is appropriate given our many customers in the UK’s renowned audio equipment manufacturing industry. But we are also excited to be at the heart of London’s newest technology cluster, which gives us the opportunity to build our diverse, creative and talented workforce.”

The development of the new office and the transfer of staff from the previous Marlow and Weybridge sites has been masterminded by Alastair Boyd, sales director for Northern Europe and Shalini Palmer, EMEA sales director for mobility. Alastair said that he was proud that Analog Devices, a global giant of the semiconductor industry, has committed to a large long-term investment in the UK’s electronics sector. Shalini said: “The UK is a hub of innovation and knowledge with many world-class companies in specific technology domains – the market is large, but fragmented. That means you have to have a prominent and enduring presence in the country if you are going to be successful here. This beautiful and impressive new office is a signal to the UK market that Analog Devices is in the UK for the long term and committed to providing all the technology and applications support that British customers need.”

www.analog.com

MK marks periodic table anniversary

2019 is the international year of the periodic table, marking the 150th year of the table of elements. To mark this milestone, MK Profile Systems has been working closely with Warwick University to create a giant periodic table sized at 3.6x2.7x2m with its structure based on both the 25 and 40 series of the MK aluminium profile system. The benefit of using MK’s comprehensive profile system is that it requires no welding, abrasive grinding or painting unlike a steel structure. However the profiles are sturdy and combine high load capacity whilst retaining an attractive design.

The 25 series profile is ideal for light duty frames and show cases but by incorporating the 40 series, which is ideal for exhibit pieces, this provides additional strength to the display piece.

Initially on display at the Royal Society Summer Exhibition in London from the start of July, the table will then be used at other shows/events later in the year. The idea for the structure came from Warwick University, a long standing customer of MK Profiles, and then MK assisted with the design to ensure that the vision became a reality.

Once all of the profiles and associated components had been delivered to Warwick University the students set to work assembling the structure and then adding the elements. This included 1064 LEDs with 9 LEDs for each element; the elements each have their own micro controller with individual addresses, then each of the six main blocks has a 12C routing board to address the (up to) 24 elements. The routing boards connect to a central hub which in turn links to the control panel that has its own controllers, 126 in total.

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Another year of engineering progression

The UK’s largest annual gathering of engineering professionals, Advanced Engineering, is returning for its eleventh edition on October 30 and 31, 2019 at the NEC, Birmingham. The trade show provides the opportunity to meet and network with OEMs and supply chain partners from sectors across industry.

The UK is in the midst of a technology boom. The government’s Industrial Strategy recognises the increasing convergence of connected industrial technologies and areas where we can compete globally. The strategy pledges to support an increase in electric vehicles with a £400 million investment in changing infrastructure, alongside a £1 billion investment in digital infrastructure.

To facilitate this technological development, the UK needs to help place its businesses at the forefront of the industry.

Bringing together thousands of attendees, Advanced Engineering incorporates all aspects of engineering, from medical devices to quality inspection technologies and technical testing and analysis. At the show, representatives from across the entire supply chain of the UK’s advanced engineering industry will present their latest innovations and business developments in front of some of its most influential stakeholders.

Not only has the show enjoyed year on year growth in terms of its visitors, but its floor space is also undergoing continuous expansion. Once a single show with 80 exhibitors, the show now features multiple co-locating show zones under one roof, covering the industry’s most advanced and noteworthy sectors including aerospace, automotive, connected, composites and performance metals.

This year, a Medical Device Engineering Zone and the revamped Enabling Innovation Zone, will join the likes of aerospace engineering, performance materials engineering, automotive engineering, connected manufacturing and composites engineering sectors to host manufacturers showcasing their innovations and new technologies to a targeted and enviable audience.

With exhibitors presenting technologies such as cutting-edge 3D printing and robotic precision machining, Advanced Engineering’s multitude of zones will place both established and emerging companies into the spotlight.

“The UK is the world’s second largest region for aerospace manufacturing, while the UK automotive industry generates an annual turnover of £80 billion,” explains Jeremy Whittingham, head of marketing at Advanced Engineering. “We believe that supporting and demonstrating the UK’s flourishing engineering markets is vital to helping it continue to prosper.”

He continues: “As a visitor, you have the chance to network and engage with OEMs and supply chain partners from sectors spanning design, test measurement, inspection and production, in industries that range from composite materials, nuclear and renewable energy, rail, marine, space and more.

“Last year, the show enjoyed a 10% rise in OEM and tier one manufacturer attendance compared to its previous year, leading exhibitors to book at a record rate for 2019’s show. With companies keener than ever to attend and exhibit at the show, Advanced Engineering is certainly positioned as one of the must-visit events of the year.”

Unique business challenges

In advance of this year’s show, Advanced Engineering has launched a new report gauging uncertainty in the engineering sector. The report, entitled Voice of Industry, brings together the experiences of leading manufacturers, on topics ranging from Brexit and the skills shortage to the rise of electric vehicles and product innovation.

The Voice of Industry report delves into the unique challenges that businesses have faced in the last two years and explores the positive results they’ve had in overcoming uncertainty. It features Q&A-style interviews with senior figures in a variety of engineering businesses including Renishaw, Atlas Copco, Kawasaki Robotics and others.

The report opens with a foreword from Mike Wilson, managing director of Kuka UK and Ireland as well as chairman of the British Automation and Robot Association (BARA). In it, Wilson challenges the conventional view that uncertainty should be a fact of life.

“The UK is well known as a source of excellence in engineering and innovation. We are the home for leading global businesses such as Rolls Royce and BAE Systems as well as many much smaller, highly creative engineering companies,” he explains. “The current economic climate is uncertain, but I have confidence the resilience of our engineering sector will weather the changing environment and may well become stronger as a result.”

The report also interviews one of these smaller companies, Xi Engineering, a digital twinning company that uses its multi-physics simulations to help businesses speed up innovation. “We offer services like simulation that help our customers create accurate models that represent the real world,” explains Mark-Paul Buckingham, managing director of Xi Engineering.

“These simulations offer a robust test-bed for companies to trial various scenarios that would take much longer if done manually. As a result, we’ve helped companies innovate in a wide variety of sectors, from high-end audio and automotive to renewable energy and transport.”

You can download the Voice of Industry report or find out more about what’s on offer at this year’s Advanced Engineering show by visiting the website and registering your attendance at the event.

www.advancedengineeringuk.com

Spirol completes major expansion at US HQ

Spirol has celebrated the completion of a major expansion to its world headquarters and largest manufacturing facility located in Northeastern Connecticut. The expansion that began in early 2016 includes significant additional manufacturing space, new state of the art warehouses for raw material and finished goods, a new quality lab and office space, new flooring, updated lighting, and significant investments in new production technology.

Jeff Koehl, CEO and grandson of founder Herman Koehl, took to the podium to address all in attendance and express pride in the accomplishments of a small company that started 71 years ago with the invention of the coiled spring pin.

Today, Spirol has grown to be an internationally recognised leading brand in the fastening, joining, and assembly industry with locations on four continents and 13 countries. In total, there are 13 manufacturing, sales and full service distribution facilities across North America, South America, Europe and Asia giving Spirol a unique vertical position in today’s dynamic market.

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Novel sensors aid tidal turbine development

Non-contact torque sensors are playing a key role in the development of commercial-scale in-stream tidal turbines produced by OpenHydro, accurately measuring rotational speed and frictional forces in a simulator for the turbine bearings, thereby allowing it to optimise the performance and reliability of its innovative products.

OpenHydro is a technology company that designs and manufactures marine turbines to generate renewable energy from tidal streams. The company’s vision is to deploy farms of tidal turbines under the world’s oceans, where they will dependably generate electricity with no cost to the environment. This method of producing electricity has many benefits.

Because the turbines are submerged, they are invisible and they produce no noise. And because they are submerged at a considerable depth, they present no hazard to shipping. An advantage that is possibly the most important, however, is that the tides are completely predictable, which means that the energy output of the turbines is equally predictable. There are no large seasonal variations and no dependence on the vagaries of the weather, as there are with many other renewable energy sources.

Reliably and efficiently harvesting energy from the tides, however, requires the use of novel technology and, in the case of OpenHydro, this takes the form of open-centre turbines that can be deployed directly on the seabed. Clearly, installation in such an inaccessible location makes reliability a prime consideration in the design and construction of the turbines. For this reason, OpenHydro carefully and comprehensively evaluates the performance of all of the components used in its turbines.

For the bearings, this evaluation involves the use of a simulator that allows the company’s engineers to determine how frictional forces in the bearings vary with different loads and rotational speeds. Central to the operation of this simulator is the measurement of torque in a shaft from the motor that drives the bearing under test. With conventional sensors, it is hard to carry out this type of torque measurement accurately and reliably, but OpenHydro found that Sensor Technology’s TorqSense RWT420 series sensor provided an ideal solution.

Like all TorqSense sensors, the RWT420 units depend for their operation on surface acoustic wave (SAW) transducers. These transducers comprise two thin metal electrodes, in the form of interlocking ‘fingers’, on a piezoelectric substrate such as quartz. When an RF signal of the correct frequency is applied to the transducer, surface acoustic waves are set up, and the transducer behaves as a resonant circuit.

Frequency-dependent strain gauge

If the substrate is deformed, however, the resonant frequency changes. When the transducer is attached to a drive shaft, the deformation of the substrate and hence the change in resonant frequency will be related to the torque applied to the shaft. In other words, the transducer operates as a frequency-dependent strain gauge.

Since the transducers operate at radio frequencies, it is easy to couple signals to them wirelessly. Hence TorqSense sensors can be used on rotating shafts, and can provide data continuously without the need for the inherently unreliable and inconvenient brushes and slip rings often found in traditional torque measurement systems. “We chose the RWT420 because of its convenient wireless operation, and because it was easy for us to fix in line with an existing shaft in our experimental set up,” said Kevin Hamnett, mechanical engineer at OpenHydro. “In addition, this model of sensor has integral electronics and a serial output, which means that we can link it directly to a laptop computer in our test laboratory. This is a very straightforward and convenient arrangement.”

OpenHydro uses the RWT420 sensor in conjunction with Sensor Technology’s TorqView software. This offers a choice of dial, digital bar and chart graph format display for torque, RPM, temperature and power. It also provides facilities for real-time plotting and for data recording, and can output stored results as files that are compatible with Matlab and Excel.

“We have found both the sensor and the software very easy to work with,” said Hamnett, “and the sensor has proved itself to be well able to withstand the tough operating conditions in our laboratory. We’ve also received excellent technical support from Sensor Technology, which was very helpful as we have never previously worked with sensors of this type. Overall, we’re very happy with product and the service we’ve received, and the sensor is providing invaluable data for our development work.”

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Sensors and Instrumentation Live returns to the NEC, Hall 2, Birmingham, from Wednesday 25 to Thursday 26 September

Sensors and the myriad of instruments that measure and collect data provide the backbone for the Internet of Things (IoT) and our increasingly connected world, and for the last ten years Sensors and Instrumentation Live has served as an annual hub for the cutting-edge technology that has been driving this connectivity.

This year’s special anniversary event, sponsored by Mouser Electronics, will be no different, with sensors among the many technologies from industry titans on display in Hall 2 at the NEC.

The Sensors and Instrumentation Live exhibitor line up continues to grow as the event approaches, and Bronkhorst, Charcroft Electronics, Keller, Kistler and Rheintacho are just a few of the market-leading companies that will be present on the show’s aisles.

In addition to the unique opportunity to source an array of products and solutions under one roof, visitors will be able to explore the latest technological innovations and gain insight from top organisations on how to grow businesses or streamline productivity in a number of the event’s newly introduced feature areas.

The Enterprise Hub

The new Enterprise Hub is a prime opportunity to discover the variety of options available to visitors that are looking to grow their business. Representatives from key engineering institutions and organisations will give a series of invaluable presentations, covering topics from funding, training and apprenticeships through to making the most of supply chains.

The Defence and Security Accelerator (DASA), The Institute of Engineering and Technology (The IET), Make UK, the University of Birmingham’s Centre for Innovation in Advanced Measurement in Manufacturing, the British Measurement and Test Association (BMTA) and Gambica are among the organisations that have already been confirmed to speak in The Enterprise Hub in September.

Innovation in Action, sponsored by PCB Piezotronics, is another new feature for the 10 year anniversary of Sensors and Instrumentation Live. Free-to-attend, Innovation in Action will see live demonstrations of some of the best products on the market – giving visitors the opportunity to see how these products work in real life and have their questions answered by the experts in person.

Companies already confirmed to give live demonstrations of their products in Innovation in Action include sponsor PCB Piezotronics, Devtank, Kistler, Sika and Bronkhorst.

The popular Innovation Showcase, sponsored by Bronkhorst, makes its return to Sensors and Instrumentation Live in 2019. Serving as an assembly of the most cutting-edge products and solutions available from exhibitors at the show, the Innovation Showcase gives visitors a chance to get hands on with devices from companies including Charcroft Electronics, Mantracourt, Broadband Technology 2000, Rheintacho and Bronkhorst and make sure they do not miss out on a single thing.

Engineering Symposium

The Engineering Symposium is an exciting new partnership between DJB Instruments and Sensors and Instrumentation Live, presenting CPD-accredited training that is driven by sensor innovation and the very latest in engineering.

DJB will bring together a team of speakers from some of the UK’s leading technology and engineering companies for a two day programme of technical training sessions, exploring topics from the basics of signal processing and analysis and control of noise sources in data to accelerometer technology and more.

Registering for Sensors and Instrumentation Live is quick, easy and completely free of charge. Not only will a free ticket provide visitors with access to these great feature areas and the best sensors and instruments on the market, but it will also provide entry to the co-located TCT Show.

www.sensorsandinstrumentationlive.co.uk
High force actuators: convert from hydraulic to electric

It makes sense to convert many hydraulic linear motion applications to electric, reaping the benefits of improved control of process variables, better accuracy, the ability to handle complex motion profiles and more. But appropriately sizing an electric actuator is crucial. We asked the experts from Tolomatic talk us through the hydraulic to electric conversion considerations

Electric linear actuators have come a long way, especially in the area of high force. Once upon a time when an application required high force, the usual linear motion solution was a hydraulic cylinder. However, as industrial automation gets more sophisticated and the need for precise control of speed, force and other variables grows, more engineers are considering electric high force linear actuators.

Now, it often happens that new high-force linear actuator applications go with electric actuators. Also, machine designers are converting existing linear motion systems from hydraulic to electric due to the technology’s many benefits. But converting from hydraulic to electric requires some thought, with a process that involves considering the actual force output of the cylinder, the duty cycle and the motion profile.

There are various ways to determine the actual force output of a hydraulic cylinder in an application. Since these components operate using pressurised oil inside the cylinder bore, you can use the basic formula:

\[ \text{Force} = \text{Area} \times \text{Pressure} \]

A simple calculation based on the cylinder’s bore and the rated system pressure will provide an estimate of the potential force output. However, this calculation may not give you the true story. The calculation will provide the force the cylinder could optimally deliver. Since it’s common practice to over-size cylinders, using this simple calculation will overstate the force required. It’s much more accurate to use the application’s actual values.

Let’s look at a real-life example: an application with a 3.5in (100mm) diameter cylinder with a 1.5in (45mm) diameter rod operating with a servo-hydraulic valve. During the cylinder’s extend stroke, the maximum pressure is 1,500 PSI (103 Bar). On the rod end of the cylinder, the down-side (or return line to the reservoir) pressure is 1,000 PSI (69 Bar). Here are two common ways that output force might be calculated:

**OPTION 1** – System pressure and piston area only:

- Force = Area \( \times \pi \times r^2 \) \times Pressure
- Force = \( \pi \times 1.75^2 \times 1,500 \)
- Force = 6,580 lbf (29.28 kN)

**OPTION 2** – Work port pressure and piston area only:

- Force = Area \( \times \pi \times r^2 \) \times Pressure
- Force = \( \pi \times 1.75^2 \times 1,500 \)
- Force = 9.62 x 1,500
- Force = 14,430 lbf (64.2 kN)

There’s a 70% difference between this result and that of Option 1. That translates into a major cost difference when considering an electric actuator. Imagine the potential for savings.

Understanding the entire motion profile

Converting a hydraulic high-force linear actuator to electric goes beyond determining force requirements. You need a fundamental understanding of the process to ensure that your final electric linear motion system is appropriately sized.

Start by defining the entire extend and retract cycle, including distances, speeds, duration of dwells, and even acceleration/deceleration times. Variables like speed and force may not be consistent throughout the entire motion profile. Often there are periods during which very high speeds or an increase in force is required. These portions of the motion profile need to be accounted for in addition to the remainder of the cycle.

Linear motion control components (actuators, servo motors, power screws) have peak and continuous ratings for speed and force and can only operate in the peak area of their ratings for brief periods of time throughout the process. During one complete motion cycle (extend, dwell, retract, dwell), the average speed and force must fall within the continuous operating region of the components’ ratings. Exceeding the continuous operating region of any of these components can diminish service life.

Hydraulic high-force linear actuator applications can have varying thrust requirements throughout their cycles. It is quite common, though, to have a consistent speed in one or both directions. This can make determining your cycle time easy. We recommend taking a video or using a stop watch to determine the duration of every move and dwell in the motion cycle.

Improving the process

If you’re putting in the effort to convert a hydraulic system to electric, look at the process itself for improvements. For example, a hydraulic application may cycle full stroke (extend and retract) during a repetitive pressing application. An electric actuator may need to extend and retract only 1in or 25mm to perform the same process, only performing a full retract for changing tooling or servicing. This can mean significant time savings.

Processes also may benefit from improvements through utilising the ability of a servo-controlled electric linear motion system to fully control position, velocity, acceleration/deceleration and force. These improvements can lead to increased part quality and reduced product scrap or rejects.

Once you’ve figured out your application’s forces and speeds, you can select the actuator power screw, servo motor and drive to complete the electric linear motion system. When making your selection, also consider the application’s requirements for size, weight, service life, IP rating and other factors.
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When it comes to exploring our own spiral galaxy, astronomers have a fundamental problem, and that’s because Earth is located on the disc of the Milky Way. So if they want to look at the centre from this vantage point, or even beyond it to the other side, the view is obstructed by countless stars. And from our terrestrial perspective it is very difficult or even impossible to determine where on our mutual disc they are located.

One of the regions we know very little about is the dense part in the centre of the galaxy, where countless stars and gas clouds cluster around a presumed black hole. But a major astronomy project is about to close many knowledge gaps, with eight institutes from several countries involved in this undertaking. The project was commissioned by the European Southern Observatory (ESO). This scientific organisation operates some of the world’s most powerful telescopes in the Chilean Atacama Desert, including the Very Large Telescope (VLT) at the Paranal Observatory with a mirror diameter of 8.2 metres.

The goal of the project is to equip the VLT with a new instrument to capture the optical signals from space. The instrument in question is a spectrograph, which is capable of simultaneously capturing a large number of cosmic objects in the visible and infrared part of the spectrum. Its abbreviated designation gives the project its name: Multi-Object Optical and Near-infrared Spectrograph, MOONS. It is coordinated by the United Kingdom Astronomy Technology Centre (UK ATC) in the Scottish capital of Edinburgh.

Spectrum instead of photo

“With a high-quality photo camera you can change the lens. But with an astronomy telescope it is the opposite – the VLT has an outstanding lens, and we will simply replace the currently connected ‘camera’ with our MOONS,” explains Dr William Taylor, scientist at the UK ATC. With its new technology, MOONS opens up entirely new possibilities in observing space, even though it does not produce large-sized images in the traditional sense. Instead, it captures minute details.

In operation, the huge lens and mirror of the VLT are pointed at the part of space that is to be observed. The ends of 1001 optical fibres in MOONS are aligned to individual objects within this cosmic region. Instead of capturing the entire selected area as a camera would, the new instrument focuses the fibres on specific points – and even these points are not just photographed, but instead their light is separated by prisms into the individual wavelengths.

“Scientifically speaking, this method yields much more information than an image,” explains Dr Taylor. “For example, we can learn about the...
chemical composition of the object. Furthermore, this allows us to calculate its dynamics, i.e., the velocity and direction of movement. Because MOONS captures the near-infrared spectrum, we can precisely analyze the redshift that the light from distant objects travelling to us is subjected to. When a star moves away from Earth, the wavelength of its light becomes longer. This is how part of the visible light shifts to the invisible infrared range, which is still close to the visible spectrum.

**Thousands of objects in view**

Prior technology allowed for a maximum of about one hundred objects to be observed individually, and only in the range of visible light. MOONS not only multiplies this number by ten, but the depth of information also increases manifold. Within the Milky Way, this will enable us to look much more precisely between the trees and get a much clearer picture of the entire proverbial forest.

“One of the objectives of the project is to create a 3D map of the Milky Way, which would allow some sort of GPS navigation throughout our galaxy,” says Dr Taylor. “The MOONS technology with its unprecedented resolution also enables us to look very far, and thus also very far back in time, We will be able to approximate the Big Bang to within a few hundred million years.” This will give scientists insights into the Universe’s infancy. And while this is already possible today to some degree, MOONS will give us a much clearer and detailed picture, according to Dr Taylor. “We will be able to map the Universe to an unprecedented depth.”

The astronomers aim to target several million objects over a period of about five years. To reach that aim, the 1001 optical fibres of the spectograph have to be pointed at the cosmic targets quickly and mostly automatically. This is achieved with an equal number of fibre positioning units (FPUs). Each FPU has two stepper motor drive units fitted to reduced-backlash spur gearheads. The one in the back moves the central axis (Alpha) of the FPU. Eccentrically mounted on this, the front motor-gearhead drive unit (Beta) simultaneously moves the fibre tip.

The combination of the two axial movements allows each FPU to cover a circular area, within which the fibre can be randomly aligned. This area partially overlaps the areas of adjacent FPUs. That means that every point within the capture zone can be controlled. To meet the challenging requirements in terms of positional repeatability, which is a must to avoid collisions between FPU end tips, the drive system solution has to be extremely precise. To ensure the required precision and to avoid collisions between the FPU tips, the systems must operate with high repeatability. The high-quality stepper motors and zero backlash gearheads come from Faulhaber, the German miniature motor specialist represented in the UK by EMS.

**Tailor-made imaging device**

“We received very valuable input from the Faulhaber Group,” reports Dr Steve Watson, who is responsible for the FPU development at UK ATC. “Without their unique know-how, it would have been impossible for us to develop this core module in this form, and above all in the kind of numbers we needed. In addition to the alignment speed of the optical fibres, they must also be highly precise. We achieve an accuracy of 0.2 degrees and a reproducibility of the position down to 20 microns.

“Given the length of the FPU and the modular design, these are excellent numbers. And the units stay properly aligned to the focal plate on which the modules are arranged throughout all positions.”

The high precision and extreme reliability of the components allows the control to be kept simple, which is another requirement to operate the spectograph flawlessly. Complex electronics and control logics would severely impede the quick and simultaneous control of 1001 units. Thanks to the high quality of the components, precise alignment is achieved by means of simple open loop control. The technology must also be very sturdy and virtually maintenance-free in order to perform its tasks without interruption over the planned ten-year service life of the system.

Project manager Dr Alasdair Fairley is already looking beyond such technical concerns: “We are making good progress with the MOONS. We expect to be able to install the spectograph in summer 2021. Commissioning will take about half a year, so that we can probably start mapping at the beginning of 2022. We are confident that the FPU will remain fully operational for ten years without maintenance.”

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Pizza maker reaps efficiency benefits

Efficient geared motors have enabled the speed of a pizza packaging line to be increased, boosting productivity and profit

All manufacturing operations aim to maximise efficiency and output, but in industries where only small profit margins are generated on each unit, this goal is vitally important. The food industry is a good example. One manufacturer of processed pizzas in Italy tackled this challenge by increasing the speed of its shrink-wrapping conveyor belts, but when their installed motors couldn’t take the strain, the business contacted Bauer Gear Motor to specify hygienic and highly efficient replacement geared motors.

The drives in question operated an infeed conveyor to the shrink-wrapping machine. Motors were controlled by variable frequency drives (VFDs) to deliver an increased performance envelope, with each typically operating between 70-80Hz. To boost production and profitability, the motors’ speed was increased via the VFDs to 80-90Hz. The traditional stainless-steel motors utilised by the manufacturer could not cope with the speed boost in the long term, with the devices producing excessive heat, which eventually caused the motors to fail completely. Clearly, a more efficient and high-performance motor solution was required to improve productivity.

Bauer Gear Motor has been providing hygienic geared motor solutions to the food and beverage industry for decades. It offers geared motors in ranges right up to IEC 60034-30-2, so blending high motor performance with market leading efficiency is nothing new for the company. In this particular case, the BK Series geared motor range, widely utilised in food and beverage processing lines around the world, was deemed a suitable replacement.

The BK06 model specified for the pizza conveyor is a right-angle bevel geared motor, delivering a distinct mechanical efficiency advantage when compared to worm geared alternatives. This increased efficiency is complemented by the fact that the BK06 utilises a permanent magnet synchronous motor (PMSM), a design which reduces heat losses from the rotor by 100% and total losses by around 25%. Compared to the original equipment, the BK06 can provide up to a 10% improvement in overall efficiency.

One inherent advantage of a PMSM is the capability to provide efficient operation at a wide range of speeds. This benefitted the manufacturer, who was able to increase output speeds to 80 RPM comfortably. The underlying reliability problem was solved, while extra performance was available to operators. The BK Series can be specified with torques ranging from 80 Nm to 18,500 Nm, so is highly versatile in meeting a wide range of operational requirements.

In addition, the BK Series is inherently compact and offers versatile mounting options, an important feature in the confined areas of a space-efficient food processing line. All motors in the range are sealed, ensuring that dust and moisture cannot compromise the internals of the motors.

Custom designed gear units extend service life of mining equipment

A manufacturer of log washer drives for the mining industry has increased the service life of its equipment and significantly reduced the cost of ownership by cutting downtime and maintenance, thanks to custom designed heavy-duty gear units

Log washers are used in the mining and quarrying of aggregates to remove the earth that clings to the small stones and sort them into predetermined sizes. They are effectively long rectangular troughs, usually manufactured from steel plate, with two thick steel shafts that run parallel to each other along the length of the trough.

Steel paddles, attached to the shafts, churn the aggregate as it is washed in jets of water to remove the earth and clay attached to it. As the aggregate is churned by the steel paddles it is also moved from one end of the trough to the other and sorted according to size. The steel shafts, or logs as they are known, are what gives the washers their name.

The gear units on the log washers are critical components as failure results in the loss of production and a significant maintenance operation to remove and repair them. So when a major manufacturer of such mining equipment was looking for a new design of heavy-duty custom gear units that would provide greater robustness, reliability, and with a longer service life than those on comparable log washers made by other manufacturers, it contacted Renold Gears.

Working with designers at the log washer manufacturer, Renold Gears was able to design new units with an identical footprint to the incumbent supplier’s, but with features that made them easier to install and remove for maintenance. Better quality seals and bearings, and a higher grade material for the gears and shafts enabled Renold to predict a service life of at least 30 percent longer than the previous units.

Additionally, as a global supplier, Renold Gears was able to provide the benefit of being able to offer local support for customers around the world with readily available spares and service support. According to Roger Godson, commercial director at Renold Gears, the project demonstrates the company’s ability to provide custom gear solutions to mining and quarrying equipment manufacturers for the most demanding and arduous applications with real benefits to end customers.

www.renold.com
motor, while also ensuring that the frequent washdowns in the food and beverage industry do not compromise the reliability of the device. A wide range of corrosion protection levels are available to specification, as well as an ingress rating of up to IP66.

For applications such as pizza conveying and packaging, choosing a future-proof motor solution can mean the difference between safeguarding profit or damaging it. However, by selecting a highly efficient, performance orientated geared motor solution, manufacturers can be sure of reliable production output and maximum profitability.

www.bauergears.com

The BK06 model specified for the pizza conveyor is a right-angle bevel geared motor, delivering a mechanical efficiency advantage when compared to worm geared alternatives. Further, the BK06 utilises a permanent magnet synchronous motor, reducing heat losses from the rotor by 100% and total losses by around 25%.

www.mayr.co.uk
Pneumatic upgrade improves bulk tube packing efficiency

When specialist manufacturer of tube packing solutions Cerulean decided it was time to overhaul the design of its popular FPS-1 tube packer, it called upon Festo to help simplify the design and deliver an improved, future-proof packing solution.

The personal care market is a rapidly evolving environment and companies in the supply chain need to be responsive, reliable and efficient. For Cerulean this entails a programme of continuous improvement and innovation: not only to introduce new products, but also to adapt existing equipment to meet changing customer requirements.

"Cerulean was an existing customer for Festo pneumatic components," says Josh Roberts, Festo business development consultant. "When they enquired about our latest components and capabilities, we took the opportunity to ask what they were trying to achieve, and what they wanted their packing machines to be capable of in the medium to long term. It quickly became clear that we could work in partnership to make significant improvements to the FPS-1 system: not only in terms of pneumatic efficiency, but also to make it Industry 4.0 ready."

Design drivers

The FPS-1 is used to bulk-pack tubes used for packaging cosmetics, toothpaste, skin cream and sun care products. The tube packing machine is typically positioned downstream from the tube maker, which supplies the empty products ready-capped. The Cerulean system can process a range of tube sizes, from 10-60mm in diameter and 50-300mm in length. The tubes can be made of materials ranging from aluminium to plastic or laminate, depending on the final application.

It is a continuous production, high speed environment, but the interface between batches of tubes being completed and then entering the packing stage is challenging. The transition usually requires either a large scale, bespoke automation solution or hand packing into cartons by multiple production workers, which is both labour intensive and less hygienic. However, as the tube products are light weight and cap heavy, they can be difficult to stack or hold temporarily while packing takes place. Pausing production inevitably leads to inefficiencies and disruption for the rest of the production line.

In discussion with Festo, Cerulean identified a number of deliverables that would optimise benefits for end-users of its tube packing technology:

- Improve capacity
- Reduce energy consumption and running costs
- Reduce noise
- Make servicing easier
- Introduce better communications capabilities to support flexible manufacturing
- Offer continued compliance with the latest safety standards
- Be Industry 4.0 ready / future-proofed
- Shaun Tombs, portfolio manager at Cerulean, explains: "Cerulean invests heavily in developing new products and adapting existing equipment to meet customer requirements. Packaging equipment is a critical investment and needs to last for many years to deliver a true return on investment. So, in addition to developing a new, future-proof version of the FPS-1 tube packer, we wanted the ability to offer customers a simple but effective way of upgrading their existing system. It was a big ask, but Festo rose to the occasion."

Practical solutions

Festo worked proactively with Cerulean to develop a new design concept for the FPS-1 system, conducting an air analysis of the existing and concept machines to prove the
It quickly became clear that we could work in partnership to make significant improvements to the FPS-1 system: not only in terms of pneumatic efficiency, but also to make it Industry 4.0 ready.

The existing design comprised multiple valve terminals positioned around the tube packer and connected with long pipe runs. By applying its pneumatics expertise, Festo was able to replace these multiple terminals with a single valve terminal, simplifying the design. A key feature is the use of sealing technology within the valve panel to create multiple pressure zones, which reduces design complexity and the physical number of valves required. Festo also conducted pneumatic sizing checks to ensure optimum valve specification. With all the valves in one place, access for servicing and maintenance is much easier and new diagnostics on the valve terminals enable fault reporting and energy usage monitoring.

Another Festo contribution is the addition of automatic cushioning so that the tube packer can run faster without damaging the product. This feature removes the need for manual set-up when cylinders are replaced, saving time and eliminating errors. In addition, the Festo safety valves are supplied with bespoke Sistema information files for each component, allowing the customer to check that everything is compliant with the relevant safety standards.

The automation and pneumatic upgrades to the tube packer are designed as two kits: a valve control kit and an actuator kit. Each kit has the same footprint as the equipment it is intended to replace. Each kit has its own unique order number – eliminating the need to order multiple components – and is supplied fully assembled and ready to install.

Says Roberts: “The Cerulean solution is based on proven, standard Festo components – including VOFA Performance Level D safety valves, MS air preparation and the CPX controller – which makes it particularly reliable. The simple kit design makes upgrading and servicing as simple as possible for Cerulean and its customers.”

Practical benefits

The new version of the tube packer is known as the FPS-300s. The upgrades have broadened the range of tube sizes that can be packed at the machine’s maximum capability of 300 units/min. So, for these tube sizes, a customer using an upgraded system could pack up to 28,800 more tubes over a 24 hour period than was previously possible. In addition, the improved system uses 5% less energy than its predecessor.

The packing process is now fully automated. The Festo pneumatics allow the FPS-300s to introduce the correctly sized standard carton and to push a layer of tubes into place without any human intervention. The length of the ‘push’ is determined by the length of the tube product; parameters which are pre-programmed into the machine. Once the first layer of tubes is in place, pneumatic grippers release the carton and allow it to fall to the next level so filling and packing can continue uninterrupted. When the carton is full, it is lifted onto an overhead conveyor and taken on for palletizing. This results in less time and less cost.

In conclusion, Toms says: “Festo demonstrated its expertise from the outset by asking pertinent questions, demonstrating it was more than just a supplier of quality components. As a leading exponent of Industry 4.0 and high performance pneumatics, Festo brought together the expertise that Cerulean needed to inform the new design. The resulting improvements in capacity, efficiency and simplicity will deliver genuine benefits to anyone using our FPS-300s tube packing system.”

www.festo.co.uk
Machined springs and wire springs compared

is a wire spring or a machined spring the best fit for your application? We asked the experts at Absaac for a comparison

Wire springs date back to before the Industrial Revolution. They established their value immediately, and have not wavered from that most useful course. Certainly, enhancements in materials and manufacturing have been forthcoming, but the basic concept has not changed much. Spring wire coiled hot or cold with ends configured within the limits of coil wire has proven to be a very cost effective, industrial tool that exhibits elasticity within the bounds of known engineering understanding. Uses range from deep ocean applications to man’s reach into the universe.

Machined springs are similar in function to wire wound springs, but they are manufactured in a different way. Although any machinable material including plastics can be used, metal in the form of bar stock is the most common starting point for machined springs. The bar stock is first machined into a thick wall tube form, attachment features are added and then a helical slot is cut revealing multiple coils. When deflected, these coils provide the desired elasticity.

The cost to manufacture machined springs exceeds that of winding wire springs. Wire wound springs can be created with just a few seconds of process time, where a machined spring requires minutes at a minimum. The machines used to create both forms are highly specialised and benefit from modern day CNC controls.

Configuration differences

Coils: The coils found on wire wound springs are typically round with sometimes rectangular and/or rectangular with rounded OD and ID surfaces. The two latter forms are less common due to cost, but when used, they provide increased stiffness and compactness of design. The rectangular coils are typically used so that the long leg is radial, but making the long leg longitudinal is possible. Rectangular wire comes in set sizes; venturing away from those sizes can be done but at an increased cost and lead time.

Coils used on machined springs are square, rectangular (radial or longitudinal) and trapezoidal. Trapezoidal coils are common to springs used in lateral bending and lateral translation. This shape allows for additional lateral motion without coil contact. The size of the coil is easily changed to fit the spring’s needs. No standard sizes apply.

Slots: On wire wound springs the space between the coils (slots) is typically uniform for torsional springs. For compression springs, they are uniform also, but the end slots usually taper to zero. This process is called “closing” the ends, and is created by an additional forming process. Optional grinding then makes the ends nearly flat. Extension springs can have a uniform slot width from zero to most any size. If desired, the coils can be pre-stressed so that an extension spring exhibits a zero slot that furthermore requires a force threshold which needs to be overcome before the coils start to separate.

Currently, machined springs come with minimum slot of about 0.51mm. Wider slots, but generally not exceeding 6.35mm, are possible. The slot width can be closed to near zero using a stress relieving process, but no pre-stressing common to wire springs is currently available.

If a compression spring application requires the absolutely best repeatability to support calibration and/or high precision uses, it is best that the coils never touch. Even better, the minimum slot width needs to be wide enough to not permit any contamination between the coils from restricting and/or changing the compression motion. Machined springs are ideal for calibration and precision usages from this standpoint. The closed aspect of wire springs ends can result in elastic differences in the presents of common contamination.

Number of coils: Wire wound springs can be made very long. A good example of a long wire wound spring is exhibited by garter springs. The general length limitation is governed by the quantity of continuous wire available on the feed spool. Machined springs are limited to about 30 coils depending upon size, but machined springs with coil numbers above 20 are rare.

Length: In a wire spring, the entire length of the wire contributes to the elasticity of the spring because the forces and moments are distributed end to end with the ends providing the interface with adjoining equipment.

Machined springs are different. The flexure, the section providing the desired elasticity is captive between the end sections that provide structure and attachment features. The structure and attachment features have infinite stiffness when compared to the flexure. Furthermore, the slots on machined springs do not taper to zero at the ends; they do remain at the full or initial width, as seen at free length. As a result, to accomplish the same elastic performance, machined springs likely need to be longer than wire ones.

Precision

10% precision is readily available from both wire wound and machined springs. 1.0% precision is available from machined springs and possible from wire wound springs when statistical methods are used for selection. 0.1% precision is probably not available from wire wound springs and only available from machined springs using post-processing techniques.

The preceding precision discussion is general and uses a somewhat broad brush. The reality is that precise dimensions are easier to accomplish with machined springs than with wire springs, and precise dimensions are an important part of the foundation for precision performance.
Of course it is also relevant to look at cost, and as discussed production time is the major influence. Wire wound springs benefit greatly from short production times. Machined springs cannot approach the low cost of wire product. However, there are many value enhancements related to machined springs usage helps to validate their usage:

- Integrated attachments
- Enhanced performance or functionality
- Higher precision
- Reduced assembly and acquisition efforts
- No sound creation from coil contacts
- No debris created by coil contacts

Without one or more of these benefits being present, there is usually little justification of pursuing the machined spring approach.

Custom attachments

Wire wound springs are somewhat limited in the possible attachments. Compression springs can be clipped end or natural, closed, or closed and ground. While the latter is a little more expensive, this is the most common because it provides the most perpendicular surface to the spring centreline. Extension springs can feature hooks or loops. While wire springs are limited to the use of wire form attachments, time has shown that creativity in the use of the wire has provided numerous, cost effective attachment solutions.

The options for machined springs are much greater. Indeed, they can possess any feature that can be machined. For compression springs, since the spring is fully machined, the ends, if selected to be flat, can be very perpendicular to the longitudinal axis of the spring. When machined springs are configured as extension springs, machined studs, threaded holes, flanges and many other features are available. For torsion springs, if a tang similar to wire spring usage is desired, it can be accomplished in such a way to make the tang very rugged. This choice will eliminate the chance of a failure at the tang root. Tang usage is designed to provide a moment on a torsion spring. To accomplish this, a force at a distance is employed. The spring provides the moment reaction, but there needs to be an additional reaction to the force. Typically, torsion springs using a tang are called upon to rub on a guide on either the OD or ID to resolve this force. In a machined torsion spring, the application of a moment is possible using a pure couple.

Features that facilitate the use of a pure couple include double tangs (external, internal and longitudinal), slots, splines (internal and external) and bolt circle configurations. One can also resolve the moment by an integral torque restraint on the coil side.

www.absasac.co.uk

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DESIGN • DEVELOPMENT • PROTOTYPING • MANUFACTURE
Nested wave springs offer increased force capabilities

TFC has introduced a standard range of nested wave springs from Smalley, available from stock in carbon and 17-7 stainless steel and in sizes from 16-100mm. And if one of the standard sizes does fit your application, Smalley can design you a custom product.

The Spirawave nested wave springs from TFC offer designers a number of benefits, not least of which is two to three times the force of conventional wave springs. Nested wave spring forces increase proportionally with the number of turns in the coil. Compressing a wave spring creates bending, or tensile stresses, which can limit the amount of force the spring can produce without failing or permanently deforming.

It is recommended that the calculated operating stress be less than the minimum tensile strength of the material in static applications and less than 80% of the minimum tensile strength in dynamic applications. Stacking single-turn springs can achieve a higher load, but one nested spring provides the desired load without the complication of stacking multiple parts.

Nested wave springs also eliminate uneven loading. When an assembly demands a stack of single-turn wave springs, they have to be aligned perfectly to prevent binding or uneven loading when compressed. Because nested spirawave springs are made from one continuous filament of flat wire, coiled in parallel, the layers stay aligned, allowing for consistent loading.

Further, nested spirawave springs are ideal for automated processes. Their study, multi-turn design allows for pick and place methods without the risk of deformation that can occur when a robotic arm picks up a single-turn wave spring. This design has no free ends, making it tangle-resistant, reducing assembly time.

Similarly, while single-turn wave spring stacks need to be installed precisely and individually to guarantee proper alignment and repeatability. Nested springs can be easily placed into assemblies, which leads to both time and cost savings.

Now that nested Spirawave springs are a standard series from Smalley, thousands of carbon and stainless steel parts in metric sizes from 16-100mm and imperial sizes from 0.500-4in are available for next day shipment. Non-stock quantities can be available in as little as three weeks.

www.tfc.eu.com

Cylinders offer auto cushioning for optimal deceleration under any operational condition

Camozzi Automation’s Series 23 pneumatic cylinders embrace the innovative concept of ‘auto-cushioning’ – reducing installation and commissioning time, to provide a cost-effective alternative to manually adjustable cylinders.

The versatile, general-purpose cylinder is compliant to ISO 6432, with its patented system automatically adjusting cushioning in order to provide optimal deceleration under every condition. The cylinder enjoys smooth, jolt-free movement over the entire cushioning phase, reducing vibrations and noise, while also guaranteeing higher reliability and constant performance over time.

The auto-cushioning system is based on the use of shaped sleeves that have a number of holes that are accurately positioned and precisely dimensioned. This enables the system to adapt to different combinations of speed and applied mass. As manual adjustments are not required, commissioning times reduce accordingly, and the cylinder effectively becomes tamperproof. Series 23 is suitable for use in many industrial applications, especially where working conditions vary over time because of changes in dimensions or wear of the host machine or mechanism, including packaging, food processing, plastics and textiles.

Available from July in diameters Ø16, 20 and 25mm and stroke lengths up to 1000mm, Series 23 offers magnetic piston as standard and has an operating pressure from 1-10 bar, within a temperature range from 0 to 80°C.

The Camozzi Automation division of the Camozzi Group offers a product range including components, systems and technologies for the industrial automation sector, the control of fluids – both liquids and gases – and applications dedicated to transportation and life science.

Camozzi Automation’s offering includes ever more products and solutions for the Industrial Internet of Things (IIoT). The company works to realise the digitalisation of production processes and on the creation of real cyber-physical systems through which it becomes possible to integrate mechanical, electronic and digital elements, constantly improving process performance.

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Russell Irvine looks at the criteria that need to be considered when an enclosure is specified

Your new industrial electronic product has been designed and the board components specified. It has been prototyped, either on a development board to check functionality and performance or laid out on a final PCB design. It has been debugged, tested, tweaked, tested again and finally signed off for production. So far, so good. Now all that has to be done is to decide on the choice of enclosure for it.

In the ideal world, the enclosure would have been selected far earlier in the process, so that, in particular, the size constraints of the PCB would be known. In the real world, the first question is normally: “what size box do I need?” The criteria outlined below that need to be considered when the enclosure is specified relate to standard or modified standard enclosures, which are normally the best choice for low/medium volume applications. For consumer-facing products, where volumes are expected to be far higher, a fully custom enclosure is normally the best approach.

1. Size: How big is the PCB? Is it to be mounted horizontally or vertically? Many plastic enclosures have slots moulded in to the sides of the enclosure for direct vertical mounting and PCB mounting bosses moulded in to the top and base for horizontal mounting. Extruded aluminium enclosures will typically have full length slots in the sides for horizontal PCB mounting. How much space, if any, does there need to be on the external surfaces for any indicators, switches, connectors, cable entries and similar components that are required? What height is required for board-mounted components or multiple horizontal boards?

2. Installed environment: Where will the product be used? Inside, outside or possibly both? For outside installation, UV stability is a potential issue for plastic enclosures. For mobile applications such as road and rail, is shock and vibration likely to be a concern? Will the ingress of dust and water be something to be considered (see point 4) and are there likely to be contaminants present – oils, chemicals and so on? Is resistance to impact damage a possible problem? If so, metal enclosures typically offer better resistance than plastic ones. Are particularly high or low temperature expected?

3. Material: For small enclosures, the choice is typically between plastic, aluminium and GRP. The most widely used plastic materials are ABS and polycarbonate. Fire resistance is a consideration; the relevant standard is UL94, which specifies a vertical or horizontal burn. The more stringent test is the vertical burn test; material will be classified as V0, V1 or V2 where V0 is the highest performance. Polycarbonate or GRP would normally be specified for outdoor use because of its better resistance to UV embrittlement and colour fading than ABS.

Aluminium enclosures are either die-cast or extruded. Both are robust and give good impact resistance and are intrinsically electrically conductive, although painted or anodised finishes must not cover mating areas to preserve continuity throughout the enclosure. Some designs of extruded enclosures offer features such as multiple fins to significantly increase the surface area to improve heat dissipation.

Die-cast aluminium housings are strong and robust; they do not corrode, are electrically conductive, have an intrinsically high level of electro-magnetic attenuation and are easily machined. With a suitable gasket fitted between the lid and the base, environmental sealing to IP68 can be easily achieved. Such enclosures can be cast with relatively thin walls, although they will always be far heavier than the equivalent sized plastic moulded one. For applications...
where protection against shock damage is important, where EMC is likely to be an issue or where high temperatures, dust or water are expected to be present, the die-cast enclosure is the ideal low-cost choice.

4. Environmental sealing: Sealing typically relies on a tongue and groove construction between the mating halves; for higher levels of sealing, a compressible gasket will also be used at the interface. The relevant international standard is IEC 60529. Typically, enclosures rated at IP54 are suitable for general purpose use; for installation in environments where dust and water are likely to be present, IP66, IP67 or IP68 would normally be specified. The highest rating is IP69K, which gives protection against steam cleaning at high pressure. In North America, enclosures' environmental sealing is normally defined as a NEMA number. NEMA ratings also require additional product features and tests (such as functionality under icing conditions, enclosures for hazardous areas, knock-outs for cable connections and others) not addressed by IP ratings.

5. Appearance/styling: Plastic enclosures offer a choice of opaque and translucent material in a variety of colours; they can also be moulded in a transparent material. Styled lids with recesses for membrane keypads and displays are available. Die-cast aluminium enclosures can be painted in a variety of different finishes and colours; extruded ones can have a clear or coloured anodising finish.

6. EMC: In many applications EMC capability is of no interest, but in others it can be a design consideration. Plastic enclosures have one specific weakness: by virtue of the intrinsic properties of the material itself, plastic, unlike metal, offers no EMC attenuation. If EM radiation emitted by the housed electronics or their susceptibility to external fields is a potential problem, the lack of screening could be an issue. Internal coatings in a variety of materials can be applied to the inner surfaces of a plastic enclosure to give different degrees of attenuation dependent on the project requirements. By offering different materials in a range of thicknesses, the most cost-effective and technically competent solution can be provided.

Metal enclosures, providing they are designed in such a way that electrical continuity is present between the top, base and removable panels and that any painted or anodised finish is purely for external decorative purposes, will provide a level of EMC likely to be more than sufficient for the majority of applications. A conductive gasket will be used to electrically link the two halves of the enclosure.

7. Fixings: Enclosure panels and covers obviously have to be secured to their mating half. There are two main methods for plastic and die-cast enclosures. In the first, a self-tapping screw is secured directly into the material of the base; in the second, a machine screw mates with a threaded bush moulded into the base. A machine screw is preferable if repeated openings and closures are anticipated during the life of the equipment, a self-tapping screw is fine for "close-and-forget" uses. A further refinement, normally only appropriate for machine screw closures is the use of captive screws, which do away with the possibility of one of the screws being lost during opening.

8. Downloadable drawings and support materials: Any reputable enclosure manufacturer will provide a comprehensive library of technical information on its web site. Typical downloadable resources should include dimensioned drawings to assist with the design and modification requirements, technical details and key product attributes.

9. Manufacturer modification capability: In order to make a standard enclosure suitable for a specific application, it will need to be modified. The best option is for the original manufacturer to provide a modified enclosure configured to the specific requirements of the project, so there is no need to over-order to allow for set-up and wastage quantities. Enclosure manufacturers will typically be able to provide milling, drilling, punching, engraving, screen printing, painting and EMC coatings for their range of standard products. Manufacturers of moulded enclosures can normally also offer enclosures moulded in custom colours to meet any applicable identifying requirements or corporate branding needs.

10. Manufacturer and distributor technical support/standard product availability: Standard enclosures for the electronics and electrical industries are produced in a huge variety of sizes, styles and types by many specialist manufacturers. A moulded, extruded or die-cast enclosure may appear to be just a simple box, but in fact it is the result of extensive design expertise that has resulted in a feature-rich housing, suitable for a use in a wide variety of applications and environments. However, a standard enclosure will inevitably need to be modified to make it fit for purpose.

Most manufacturers and distributors keep stocks of standard enclosures on the shelf and the modern trend is that distributors are now joining manufacturers in providing technical support to their customers, working with them at the design stage to help choose the most appropriate enclosure for the application.

www.hammond.com

Russell Irvine is sales manager at Hammond Electronics
A practical and safe way to access controls

Front panel interfaces provide plant operators with an easy, safe way to access controls, and Murrelektronik provides panel interfaces with many different country-specific outlets and data connectors, providing international solutions and comprehensive approvals.

In machines and systems, you regularly need access to the controls: during initial start-up, for service work and when production has been halted – which is where things get time-critical. Normally to access the controls via laptop or a diagnostic device the control cabinet must be opened by a trained electrical engineer. Sometimes, the controls are installed together with electrically hot components. In this case, due to safety reasons, the entire system needs to be powered down and isolated, even for a simple software adjustment job. That costs time and money. Also it is easy for dirt and humidity to enter the interior of the control cabinet when the door is open, which can damage other components.

With the Modlink MSDD front panel interfaces from Murrelektronik, a laptop or diagnostic device can be connected in a way that prevents these problems from occurring. Modlink MSDD is a modular system that consists of standardized single and double frames made of metal or plastic and can be installed into the control cabinet doors.

More than 170 different inserts with country-specific outlets and data inserts (for example SUB-D, RJ45 or USB) can be snapped into place. This highly flexible system is perfect for companies that deliver their products worldwide. After installing a standard frame into your door, you can easily snap in the corresponding inserts for the destination country.

Modlink MSDD front panel interfaces have a protection class of IP65 ensuring that they can withstand rugged environments. EMC requirements are fulfilled via cladding panels that sheath the full surface area of the data inserts. Ground straps can be connected to these plates to discharge any interferences.

In industrial applications, outlets must be secured, according to the standard, up to 20A using residual current devices (RCDs). To meet this requirement a commercially available 2-pin safety switch can be integrated in Modlink MSDD. The power outlet is fuse-protected and complies to the standards. If an error occurs, simply reset the circuit breaker without having to open the doors of the control cabinet. This insert can be equipped with a USB-A or RJ45 connection for data communication. The result is a complete programming interface including a secured electrical connection and features a range of country-specific choices.

For international applications, approvals are important. The Modlink MSDD front panel interfaces are UL-approved and enable North American manufacturers to implement this solution easily and supports companies when importing their components and even cause them to fail. We avoid all of this by using Modlink MSDD.

The Modlink MSDD service interfaces are frequently located in clearly visible locations on a control cabinet, a machine or a system. This is ideal for applying system designations, barcodes or warning notices to them. Murrelektronik can laser these types of information directly onto the lid of the Modlink MSDD – regardless of quantity and at no additional cost. This simplifies installation since fewer additional labels need to be attached.

For a look at the system in action, Michael Keppler, head of electrical component standardisation in R&D at Krones, says: “We install Modlink MSDD interfaces in control cabinets and machine housings. This creates a way for us to access the controls. Our service engineers use this outlet for initial start-ups, and to maintain the laptop power supply. The RJ45 interface gives us a way to connect into the machine network.”

One of the most valuable features for Krones is that they no longer need to open the doors on control cabinets. “In our customers’ production facilities around the world, environmental conditions are frequently challenging, with high humidity levels being just one example,” explains Keppler. “This is why all of our control cabinets are equipped with air-conditioning units. When the cabinets are opened, dust and damp air inevitably find their way inside. Then condensation forms on components inside the cabinet and that causes a serious moisture problem. It can damage components and even cause them to fail. We avoid all of that by using Modlink MSDD.”
GEOS


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Can your enclosure offer the same combination?
Rittal unveils AX and KX enclosure ranges

The AX and KX enclosures are both embedded with digital processes, delivering simpler, faster assembly and component installation, greater flexibility and enhanced safety. In other words, Rittal has rethought and redesigned the two enclosures inline with the principles of Industry 4.0.

Digital transformation brings new challenges for products, their operating environment and their operational availability. This launch marks a transformation of AE – a standardised product made by Rittal for more than 50 years. More than 35 million AE enclosures have been manufactured making it the most popular compact enclosure in the world.

Digitalisation and automation in the era of Industry 4.0 are creating new enclosure challenges. “We understand the principles behind digitalised industry and we have developed a new generation of compact and small enclosures in response,” explains Uwe Scharf, managing director of Rittal with responsibility for the IT and industry business units and marketing. “In conjunction with the introduction of our Blue e+ range and the VX25 large enclosure system, this means all our core products have been entirely redesigned, and are fit for Industry 4.0.”

The digital age is increasingly making its presence felt in switchgear workshops with a growing need for automation, greater flexibility and product availability. Rittal provides effective support for the entire value chain surrounding the production of panels and switchgear – from engineering to ordering to automation. Its digital product twin delivers high-quality data for the entire design, configuration and manufacturing process. QR codes allow all parts to be precisely identified and assigned. The launch of the AX and KX, brings compact and small enclosures inline with this approach. For example, the Rittal Configuration System (RiCS) provides customers with a fast and simple system for configuring enclosures, accessories and modifications and an automatic plausibility check helps prevent erroneous choices. The results can be transferred directly to Rittal’s online shop, and this then gives the customer immediate access to both price and delivery date. The data can also be uploaded to EPLAN software engineering software and used for downstream tasks, complete with any modifications. This substantially cuts the time and effort needed for the engineering process.

Once the customer order is received by the Rittal Global Distribution Centre (GDC), it is shipped directly to the customer. The GDC is seamlessly integrated with the nearby, highly automated manufacturing plant, ensuring the timely and reliable shipping of the required items. As a result, all standard products can, where required, be sent to customers based in Germany within 24 hours.

Simple, fast, flexible and safe

The two latest additions to the Rittal enclosure portfolio contain improved features, along with new opportunities for value creation. The time-savings start at the point of delivery to the customer: panels can be removed individually because there is no need for the usual disassembly work. Doors and cam locks are easier to install, typically without the need for tools. The wall mounting bracket can be quickly screwed into place from the outside of the enclosure, without impacting the enclosure’s protection rating. This substantially reduces the risk of damage during transit as the brackets, which protrude beyond the sides of the enclosure, can be attached on-site at the final destination.

As the rails have a 25mm spacing (pitch pattern) the AX and KX can use accessories from the VX25 portfolio, such as lights or terminal blocks. This keeps the inventory of the smaller parts to a minimum, and there is no need for machining, such drilling, etc.

Safety is a high priority for all Rittal enclosures. Installing components into the AX and KX leaves their protection category unaltered and the same is also true of their UL certification, which is essential for deployment on hazardous environments as standard.

Enclosures deliver reliability and flexibility in the most challenging of environments

Protecting sensitive electronic equipment in a harsh environment is always a challenge, one that Spelsberg has been meeting consistently since 1904. Its latest solution is the innovative GEOS, a highly durable enclosure that offers exceptional resistance to moisture and wide customisation options. It’s a protection solution that offers versatility in tough environments as standard.

One of the defining features of the GEOS that makes it a true all-rounder is its unique drain seal protection system. Drainage channels in the chassis of the GEOS move moisture away from the lid seal area, which ensures that over long-term usage, water poses a decreased risk to the integrity of the seal. Instead, moisture is directed to the rear of the enclosure, well away from the access point. Matched with an overlapping lid and an elastomer seal, challenging application environments with high levels of moisture are easily met by the GEOS.

Durability is a further key feature of the GEOS. Ingress protection can be specified at either IP66 or IP67 depending on customer requirement, but an impact protection rating of IK 09 is standard across the GEOS range. To further minimise wear and tear, the polycarbonate construction delivers exceptional resistance to adverse weather, temperature fluctuations, corrosion and UV rays. With these inherent features, the GEOS enclosure is often specified in coastal locations, as it can resist the elements and salty sea air.

The GEOS offers great versatility as standard thanks to a number of inherent features; however, it also offers a host of application specific options where required. Ten model variants complete the range, with various base sizes, heights and side wall measurements built in. Transparent lids can also be specified for ease of inspection, without having to open the enclosure. Screw or quick release mechanisms are also available.

Spelsberg’s in-house customisation service delivers even further specialisation for the GEOS, ensuring that it can seamlessly integrate with existing electrical architecture for ease of use. CNT machining capability and a dedicated in-house production line means that entirely bespoke GEOS enclosures can be delivered on greatly reduced lead times. Functional samples are even available within 24 hours. Drilling, milling, printing, wiring and customised packaging is all offered. This gives end users the ability to specify a perfect enclosure rather than simply settling for a one-size-fits-all solution.

Spelsberg reports that the GEOS has become a favourite with users in the energy, communications and automation sectors due to its high reliability. A combination of ruggedness, innovative features and wide-ranging customisation options means the GEOS is well suited to protecting vital electrical infrastructure in almost any challenging environment.

www.spelsberg.co.uk
The digital age is increasingly making its presence felt in switchgear workshops with a growing need for automation, greater flexibility and product availability. Rittal provides effective support for the entire value chain surrounding the production of panels and switchgear—from engineering to ordering to automation. Its digital product twin delivers high-quality data for the entire design, configuration and manufacturing process.

QR codes allow all parts to be precisely identified and assigned. The launch of the AX and KX, brings compact and small enclosures inline with this approach. For example, the Rittal Configuration System (RiCS) provides customers with a fast and simple system for configuring enclosures, accessories and modifications the North American market. Overall, the new design features make the compact enclosures more robust, and ensure greater resistance in particular to dynamic loads.

Suitable for many requirements
The new product lines provide answers to many varied needs. KX small enclosures (from 150x50x80mm) are ideal if only a few components are to be housed in terminal boxes and bus enclosures. AX compact enclosures are between 120mm and 400mm deep, with a maximum size of 1,000x1,400mm.

For all models, there is a choice of spray-finished sheet steel or stainless steel. Despite the greater number of potential use cases, the total number of components and accessories, and as a result complexity, has been markedly reduced.

www.rittal.co.uk

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SKF says split roller bearings are ground breaking

Most advances in split bearing technology have been incremental improvements over the last 100 years. However, with the introduction of the SKF Cooper split spherical roller bearing, a new level in product quality and precision engineering has been achieved by combining SKF’s spherical roller bearing and SKF Cooper’s split bearing expertise. Manufactured at SKF Cooper in the UK, the new split bearing range enables customers to significantly reduce downtime by the replacement of solid bearings in-situ.

The SKF Cooper range of split spherical roller bearings is currently available in the 231 series for shaft diameters 240 to 450mm, which are typically used in mining conveyer and stacker/reclaimer applications. Later in the year, smaller sizes will be introduced, suitable for the quarrying sector.

www.skf.co.uk

Fast connection tools to accelerate sealing

Inefficient, unproductive plugging or sealing methods increase costs through decreased operational output. That, along with recurring maintenance issues, difficult seal replacements and short life spans, has resulted in many companies making the change to FasTest.

FasTest is an American manufacturer of engineered connection tools for leak and pressure testing with over 50 patents secured, the company makes connection tools that are easy and quick to use, safe and reliable. FasTest connectors are ideal for many applications such as: piping, cooling, heating, fluid, hydraulic, pneumatic, refrigerant and fittings.

www.tom-parker.co.uk

Stäubli upgrades MPC rail industry connecto

Stäubli Electrical Connectors has upgraded its MPC range of rail industry modular power connectors as part of its process of continuous improvement. The enhancements include new generations of straight and right-angled connectors.

The insulators in the new ranges are made of improved plastics that provide increased insulation resistance of up to 1 kV and a lower degree of flammability. They meet European rail applications standard EN 45545-2, including the most stringent HL3 R23 hazard level class for underground and high speed trains.

The insulation, combined with a new zinc die-cast alloy used for the side elements, has allowed the units to be more compact, with weight reductions of up to 30% over previous models while remaining 100% compatible.

www.staubli.com

Reliance introduce EtherCAT to Cool Muscle motor range

Reliance is pleased to announce a new product to their motion control range - the RCM1 with EtherCAT. This new product is an extension to their Cool Muscle Motor servo system and integrates the EtherCAT communication protocol within the unit.

The Cool Muscle Motor servo system has been a premium, reliable product in the Reliance motion control catalogue range for many years. The range has now been extended with the addition of EtherCAT compatible servo motor versions in NEMA sizes 17 and 23 for both short and long units. EtherCAT is a high speed, real-time communication protocol that has the ability to update numerous devices in the microsecond range. This makes it ideal for multi-axis synchronised control or in systems where a master is co-ordinating a large variety of devices such as sensors, motion axes and distributed I/O.

www.reliance.co.uk

Latest addition to HBM’s CFT piezoelectric range

For applications that require the coverage of a wide measuring range, such as presses with a large force measurement range, HBM has introduced the new CFTplus force transducer, which features improved accuracy and calibration in three measuring ranges. Designed for industrial applications, particularly within the manufacturing sector, the new CFTplus series is calibrated for the measuring ranges: 1%, 10% and 100%, and can be used immediately on installation.

www.hbm.com

The kit you need

Our look at the month’s most interesting product launches

What’s New?
Your guide to the industry’s most useful online engineering tools. Follow the links to each one, or visit the Industrial Technology website for a full listing of promoted configurators with active links: [www.industri 技术.co.uk](http://www.industri 技术.co.uk)

### Power Transmission

**Create your own drive specification quickly and easily**

STOBER Drives has just released its new online Configurator, an innovative tool that allows Motion Control and Power Transmission drive designers and engineers to create their own drive specification in real time.

Using the new Configurator, specifiers can create many different configurations, integrating products from the STOBER motion product portfolio, with just a few clicks. Once the specifier has used the fast and easy configuration interface to build the optimum drive for their needs, the data and drawings can then be downloaded, and a quote requested from STOBER.

The powerful Configurator has the most popular 3rd party servo motor brands inside for quick selection of a STOBER gear unit to suit, or you can take the complete STOBER Geared Motor Solution.

The new Configurator allows mechanical and design engineers to save a considerable amount of time, as until now, they had to gather and compare extensive manufacturer-specific documents. Now, they can use this new online tool to quickly and easily construct the right solution from gear units, geared motors, motors, drive controllers, motion controllers and matching software.

The intuitive and practically designed interface allows users to quickly design their own unique solution in real time with just a few clicks. Numerous filters and comparison options are available within the online Configurator.

[https://configurator.stober.com](http://https://configurator.stober.com)

### Valves

**Configurator for process valve units – fast and easy**

From manually actuated process valves to fully automated ones, the new configurator for butterfly valve units makes it quick and easy for you to find the right solution.

Free and easy to use, simply enter the key parameters for your application and you’ll see the first set of suggestions for your solution straight away.

Configured process valve units are tailored and delivered ready to install, with all components perfectly matched: butterfly valves, quarter turn actuators, pilot valves, sensor boxes, positioners, adapter kits and hand levers.

- Simple, fast and reliable configurations
- CAD data and documentation directly downloadable
- Units delivered assembled and ready to install

[www.festo.com/kzva](http://www.festo.com/kzva)

### Connectivity

**Get connected and start your IoT journey**

**Sense, sort and send your machine data:**

- Minimise downtime, speed up response times and maximise profits

Unlock the potential of your application with simple, robust connections for equipment of all types and ages.

- Rapid retrofit robust hardware
- Easy install and setup – Great software APIs
- Use I/O lines and existing sensors
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For an enhanced machine connection, the BB-400 Smart Controller with edge processing offers flexible intuitive software options to get you up and running fast. Brainboxes are specialists in Serial and Remote I/O communication that meets high specifications.

**Over 30 years of smarter technology**

All Brainboxes products are designed and built in the UK – offering you uncompromising quality and first-rate support. Customers choose Brainboxes time after time because they “just work”

[www.brainboxes.com](http://www.brainboxes.com)

### Fastening and Joining

**GESIPA goes Industry 4.0 with iBird® Pro riveting tool**

GESIPA extends its Bird Pro series by a networked battery-powered setting tool, the iBird® Pro. This device has been particularly designed for integration into IoT/Industry 4.0 and lean production environments.

The iBird® Pro tool can be connected to the iBird® Pro App on up to three devices simultaneously that keeps the operator informed about setting processes as well as the operating status of the setting tool at any time.

Easily connected via a QR code, the app keeps a log of the setting processes using various rivet counters. A countdown function, indicators for battery level and maintenance as well as a display of the process keep the operator up to date during the setting process. In addition, it also advises the operator on how to handle the device as well as instructions for maintenance and repair that can be recalled at any time in order to answer any questions.

As an option to be equipped with a premium software package, the iBird® Pro can provide a setting process assistant that supports the operator in analysing the results of the setting process. Successful riveting configurations can be stored and then be combined into any job list as required.

[www.gesipa.co.uk/ibird_pro](http://www.gesipa.co.uk/ibird_pro)
Over 300+ national and international suppliers will gather in Manchester this October for Northern Manufacturing & Electronics 2019 together with the RoadRailAir event. The exhibition will feature live demonstrations and new product launches of machine tools & tooling, electronics, factory & process automation, packaging & handling, labelling & marking, 3D printing, test & measurement, materials & adhesives, rapid prototyping, ICT, drives & controls and laboratory equipment.

Free industry seminar programme online @ www.industrynorth.co.uk

The exhibition is free to attend, free to park and easy to get to. Doors open at 9.30am on Wednesday 2nd October.