

T H E E L E C T R O N

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NORTHERN MANUFACTURING AND ELECTRONICS

The North and West of the UK and Ireland are key areas of industrial activity and vitally important drivers of the UK economy. Aerospace, heavy engineering, high-tech electronics, medical technology and defence are all strongly represented across the region.

On 30th. September and 1st. October EventCity in Manchester was host to the Northern Manufacturing and Electronics 15 Exhibition, which provided a major focus for manufacturing and technology in the region, with around 200 exhibitors and eight free seminar topics.

The exhibition is now in its third year and is a companion event to the Southern Manufacturing Show. In the September 2015 (Volume 121) issue of *Electronics World* it is described as "an extremely worthwhile event for electronics professionals across the North" with "the number and variety of electronics vendors participating creating a particularly broad appeal."

One of the show's best features is said to be "the chance to address multiple issues with great efficiency" and "an intensive representative slice of the UK electronics sector along with a large number of associated services and products from general industry gives the event an unparalleled profile."

A new show feature for 2015 was the RoadRailAir Showcase, which was designed to focus on the North's supply chain strengths in the aerospace, automotive and public transport manufacturing sectors, and there were live demonstrations by many of the world's leading machinery and equipment manufacturers.

The seminar programme reflected the growing emergence of 3D printing with presentations on 'An Introduction to 3D Print and the exciting Benefits it brings to Manufacturers' by Wayne Kite of Stanford Marsh, and 'Shaping the Future of Manufacturing: How Additive Manufacturing and new Electronics Modules can drive Commercial Success' by Alistair Williamson, Managing Director of Lucid Innovation and Director of The British Industrial Design Association.

This latter presentation described how 3D print is now "at a tipping point" with "most of the cost of modern products now in electronics". The roles of Arduino and Raspberry Pi modules in easing the manufacture of many products was highlighted, as was the embedding of electronics into single parts. Markets were growing, particularly in areas such as the production of dental implants where the production of implants and crowns is now increasingly being made at the point of use. Eyewear is another example, where production for high value applications is moving increasingly out of factories thanks to cheap and powerful electronics.

Additive manufacturing allows for the direct conversion of design construction files into fully functional objects, whilst with 3D printing objects from sand, glass, metals, or plastic are built up in layers until they have reached their final shape. The objects may then be heat treated following the 'printing' of the object.

The first five articles in this issue of *The Electron* focus on 3D Printing and Additive Manufacturing, reflecting its strong theme throughout the exhibition, as well as its growing importance within the electronics sector.

RESEARCH PROJECT INTO BULK ADDITIVE MANUFACTURING

Automation solutions specialist Kuka Systems UK have teamed up with research engineers from the Nuclear Advanced Manufacturing Research Centre at Sheffield University to design a 10m by 5m cell for building near net shaped parts from the ground up as well as adding metal features to large structures.

The cell comprises a 6-axis Kuka robot mounted on a 3-axis, 5m high gantry and a 2-axis manipulator with 3.5m diameter turntable. The robot arm is equipped with a TOP TIG arc welding system that integrates the wire feed into a welding torch.

The robot works directly from a CAD model to lay down weld material to create 3D geometries and add non-critical structural features to structures such as large pump and valve casings or pressure vessels.

The robot can also carry a variety of end effectors which enable the research team not only to potentially deploy a range of welding techniques using metal powder and wire but also to inspect and finish parts in a single set up.

The project is funded by the High Value Manufacturing Catapult and is designed to show how additive manufacturing can be more easily introduced into existing production lines. It stemmed from Kuka's previous involvement in building a small shaped metal deposition cell that was originally supplied to Rolls Royce and later moved to the nuclear AMRC facility.

The research team asked Kuka to tender for a large cell based on the same technology so they could work on larger components. A new design was evolved and the new cell was built and installed over a six month period. Discussions are now underway to upgrade the cell and further expand its capabilities and flexibility.

Kuka Systems UK is based in Halesowen, West Midlands, and produces automated production solutions for a range of industry sectors including aerospace, automotive and nuclear decommissioning.

Contact: www.kuka-systems.co.uk

ADDITIVE MANUFACTURING REVOLUTIONISES FILTER MANUFACTURE

Additive manufacturing has been proven to be a viable and cost-effective alternative to traditional manufacturing methods when producing specialist products and can quickly result in solutions that were never before possible.

A good example of this is the straightliner filter made by Warrington-based Croft Additive Manufacturing. This filter offers a low pressure drop resistance that cannot be manufactured using traditional subtractive techniques because when manufactured conventionally the holes in the perforated plate are at an angle to the filtration flow, changing the characteristics and causing turbulence in the functionality of the filter.

By using additive manufacturing it became possible to build a filter with holes at the same angle as the flow to allow the filtrate to run through with much less resistance, resulting in both energy and cost savings for the end user. In addition, the bespoke filter was developed to remove any joins between different elements so providing increased strength and durability.

With the aid of the North West's first SME owned Realizer SLM-250 metal 3D printing machine the company offers innovative flexible product design and manufacturing services. Previously unattainable metal components and assemblies can be designed and produced directly from 3D CAD data.

Croft Additive Manufacturing is the sister company of leading filter manufacturer Croft Filters and may be contacted at www.croftam.co.uk

3D METAL MOULDING FOR THE MASS MARKET

Many manufacturers are acquainted with the concept of 3D metal printing and metal additive manufacturing. After all 3D printing has existed for over 30 years, although its application in manufacturing industry is somewhat more recent. Less well-known, however, is the concept and application of metal injection moulding (MIM), particularly amongst companies that need to procure complex metal components.

MIM is predominantly used for prototype production as the technology is, as yet, not fast enough to be suitable for application in mass production environments. Additionally, 3D metal printing can only be used to produce components from a relatively small selection of materials. A company called CMG Technologies is, however, poised to change this.

The article entitled '3D Metal Moulding for the Mass Market' in the September 2015 issue of Production Engineering Solutions explains how CMG Technologies have successfully trade-marked the term 'CMG Technologies 3D Metal Moulding' and quotes the company's Technical Sales and Marketing Director Rachel Garrett as follows:

"Rather than being seen as a competitor to 3D metal printing, MIM can actually provide the stepping stone needed between the prototype and volume production. Once the initial tooling is complete we are able to deliver huge volumes of parts in a far wider variety of materials."

The technique is noted to be particularly well suited to producing parts with complex geometries and even the smallest parts can perfectly replicated time and again. CMG Technologies can, for example, manufacture a component with major dimensions of just 1.85mm x 1.6mm x 0.835mm with a 100µm hole and a small groove on one of the faces at a cost that is far lower than that required by traditional methods.

Ms. Garrett states:

"3D metal moulding is most effective for small, complex components in annual volumes of 1000 or more, although if the part is particularly intricate and expensive the 3D moulding process could still be cost-effective for volumes of 500 or more. And because we mix our own feedstock, we have the in-house metallurgy capabilities to produce parts from a wide range of materials including titanium and precious metals. This makes our capabilities particularly attractive for manufacturing parts used in the aerospace and medical devices sectors."

Both MIM and 3D metal printing use powdered metals, an organic binding agent and a heating process to remove this binder. 3D printing builds components by delivering the powdered metal and binder in alternate layers through a nozzle controlled by a computer working to a CAD drawing. The initial process does not achieve the required strength so parts must go through a secondary process which involves fusing another type of metal into the shape.

There are currently two methods of 3D metal printing, namely Selective Laser Sintering (SLS), also known as Direct Metal Laser Sintering (DMLS), which uses a laser to seal the powdered metal into a hard object, and Selective Laser Melting (SLM), which completely melts the powder to form a homogenous part. SLM can only be used for single materials and is therefore unsuitable for alloys.

MIM uses metal powder mixed with organic binder. A custom-made tool is fitted into a standard moulding machine and the mixture injection moulded into it to produce a net-shaped 'green' component. This component is then transferred to the de-bind ovens to remove the binder and produce a 'brown' component that is sintered in a controlled atmosphere ready for any secondary processes that may be needed.

Contact: www.cmgtechnologies.co.uk

TR FASTENINGS INVESTS IN 3D PRINTING

Leading global manufacturer and distributor of fasteners, fixings and related components TR Fastenings has invested in a highly sophisticated 3D printer for the purpose of creating, testing and prototyping parts, predominantly for the automotive industry.

The 3D printer uses molten plastic to produce the prototypes, enabling customers to see what a particular part might look like before committing to ordering a large quantity.

With more than 90 per cent of TR fastenings' revenue deriving from non-standard components to customer specifications, engineering product development is a key group activity that frequently demands design and pre-production component prototyping.

Malcolm Diamond of TR Fastenings states:

"In the past, not only did the manufacturing of component parts take an average of two weeks to complete, but the costs exceeded thousands of dollars, thus prompting a re-assessment of optimal prototyping for customer product development. Extensive research by my colleagues in our marketing and IT systems teams into US and UK based 3D printing manufacturers has led to our first investment in a highly sophisticated industry standard printer and we are delighted by the response from our customers."

TR Fastenings were exhibitors at Northern Manufacturing and Electronics and their contact details are: TR Fastenings Limited, Unit N, North Stage, Broadway, Manchester M5 2UE. Telephone: 0161 877 6800. Email: manchester@trfastenings.com

ALCOA TO EXPAND R AND D IN 3D PRINTING

Alcoa Inc., a global leader in lightweight metals technology, engineering and manufacturing, has announced that it is to significantly expand its R and D facilities so as to "improve and advance" its additive manufacturing materials and processes.

The \$60 million project will include an additive manufacturing centre near the company's headquarters in New Kensington, Pennsylvania, that will focus on "processes, product design and qualification". The company will produce additive materials for the aerospace, automotive, medical and construction sectors.

CEO Klaus Kleinfeld states:

"By combining our expertise in metal alloys, manufacturing, design and product qualification, we will push beyond the limits of today's additive manufacturing. This investment strengthens our leadership position in meeting the fast-growing demand for aerospace components made using additive technologies."

Construction is expected to be finished early next year with 100 new full-time workers in place by 2017.

INTEL TO INVEST IN QUANTUM COMPUTING

Intel Corporation, the US-based multinational manufacturer of semiconductor microchips, has announced that it is to invest \$50 million in quantum computing, which "could radically advance complex problem solving".

Intel has said that it will undertake a decade-long collaboration with Delft University of Technology in The Netherlands and TNO (the Dutch Organisation for Applied Research) in order to "make real the kind of quantum computing that could tackle seemingly insurmountable problems". Potential applications include "intricate simulations" such as large-scale financial analysis and more effective drug development.

Mike Mayberry, Managing Director of Intel Labs, is quoted in *Machinery Market* (24th. September 2015) as follows:

"A fully functioning quantum computer is at least a dozen years away, but the practical and theoretical research efforts we're announcing today mark an important in the journey to bring it closer to reality."

Unlike digital computers, quantum computers use quantum bits that can exist in multiple states simultaneously, offering the potential to compute a large number of calculations all at once, speeding up results significantly.

IBM LAUNCHES CLOUD-BASED SERVICE FOR MOTORISTS

IBM has launched a new cloud-based service for car drivers that will facilitate real-time diagnostics on such things as engine trouble, provision of insights for predictive vehicle maintenance, and guidance to drivers on the most efficient traffic routes.

Dirk Wollschlaeger, General Manager (Global Automotive Industry) for IBM is quoted in *Machinery Market* (24th. September 2015) as follows:

"With the significant increase in connected cars, automotive manufacturers have the ability to take near-real-time data and put it to good use for drivers in a variety of ways - from finding the nearest parking space and the most efficient route to alerts that help drivers expect the unexpected. By combining data directly from the car with other sources, the insights derived by the IBM IoT for Automotive Solution have the potential to change how we interact with our vehicles."

The Automotive Solution builds on IBM's new Internet of Things (IoT) Division, which was launched in September. It is part of a \$3 billion investment in industry-focused uses for its cloud, analytics and cognitive computing technologies.

The IBM IoT for Automotive Solution is available on IBM Cloud's SoftLayer infrastructure and more information is available on the website ibm.com/iot

AMBULANCE DRONE PIONEERED IN HOLLAND

Alec Momont, a graduate student from Delft Technical University's Faculty of Design Engineering, has successfully developed a working prototype of a 'drone ambulance' that is capable of delivering an automated defibrillator to a patient who has suffered a heart attack.

The concept behind this unique type of drone is that it could carry essential medical equipment weighing under 4kg, such as an insulin kit for emergency use by a diabetic, an oropharyngeal mask for a person in acute respiratory distress, or an inflatable life jacket.

An emergency system has been conceived that will use a network of drones strategically placed every twelve square kilometres that could be activated by an emergency call centre. The caller would be located by his or her telephone signal and the data transmitted to the drone which would then travel at 100 km/h to the scene. A two-way audio and video communication in conjunction with an emergency rescue specialist can then instruct either the patient or the nearest available person on how to use the emergency kit. The patient thus receives potentially life-saving treatment well before the ambulance arrives.

It is envisaged that by providing help in possibly under a minute cardiac arrest survival rates could be improved from 8 per cent to 80 per cent.

Until recently drones or 'unmanned aerial vehicles' (also referred to as 'remotely piloted aircraft systems' or 'unmanned aerial systems') have tended to be confined to military applications, but at the CES Show 2015 in Las Vegas the Consumer Electronics Association estimated that the global market for consumer drones will reach \$130 million in 2016 and could be worth \$1 billion by 2018.

The first commercial UAV Show was held in London in October 2014.

THERMOPLASTIC RUBBER TO REPLACE SILICONE IN CABLES FOR MEDICAL APPLICATIONS

Until recently silicone has been the undisputed leader for cable jackets adapted to medical applications on account of its highly flexible, highly resistant and smooth properties. The new BioCompatic thermoplastic rubber cable, however, is set to raise standards in this area.

Compliant to REACH and RoHS2, the BioCompatic cable by Northwire is just as flexible and soft to the touch as silicone cables, but the jacket material has a much higher chemical, sterilisation, abrasion, cut and crush resistance

For crush testing Northwire's engineers subjected BioCompatic to extremes that exceed real-world conditions. In order to evaluate its performance in hospitals a test was designed that simulated a 200-pound medical gurney (wheeled stretcher) rolling over the cable. The silicone cable failed after less than 9,300 cycles, whereas the BioCompatic specimen survived over 186,000 cycles.

BioCompatic can be rolled over, pulled or bent with no danger when handled and displayed resistance that was equal to or superior to silicone for all sterilisation types, including steam and gamma radiation. Its resistance to extreme temperatures was tested with steam sterilisation, preserving physical properties through over 500 autoclave cycles.

BioCompatic also resisted the most aggressive exposure to hospital-grade disinfectants, retaining 100 per cent of its original material performance after 24-hour total immersion in a variety of chemicals including Betadine, alcohols and hydrochloric acid.

BioCompatic meets the strictest specifications in its main application field, such as ISO 10993-5 for cytotoxicity, or USP Class VI certification, which guarantees compliance with United States Pharmacopeia (USP) for healthcare technologies.

Krista Lindquist, Materials and Manufacturing Engineer for Northwire, states:

"Compared to the long and costly curing requirements of silicone, the industrial processes are much shorter and price-competitive at Northwire. It takes ten to twelve weeks to deliver a silicone solution, whereas BioCompatic is available in five to fifteen days."

BioCompatic is the first product to be launched by Northwire since its acquisition by Lemo in 2014.

Lemo were an exhibitor at Northern Manufacturing and Electronics and their contact details are as follows:

Lemo UK Limited, 12-20 North Street, Worthing, West Sussex BN11 1DU. Telephone: 01903 234 543.

Email: ukadmin@lemo.com

ENHANCED PROGRAMMING AUTOMATION FOR UK FABRICATORS

One of the products that was demonstrated for the first time in the UK at Northern Manufacturing and Electronics was a software product called TruTops Boost, which has recently been launched by Trumpf Limited, a specialist in metalworking technologies, and particularly in punching, profiling and bending, as well as complementary software development.

TruTops Boost merges all of the steps needed to generate sheet metal programs into a single system. The enhanced automation means that creating NC programs for laser profiling, punching and bending is now much simpler and quicker with calculations that are performed automatically, and there is also full 3D CAD design functionality.

TruTops Boost has two operating levels, namely HomeZone and TecZone. The HomeZone control level is ideal for viewing all of the orders on hand and for preparing programs quickly in an automated process which is activated by an orange Boost button. The button activates a variety of automated calculations for selected objects and once the 3D data has been imported the software detects, bends and produces an 'unfolding' drawing. A simulation running in the background examines, even at this early stage, whether the particular design can be manufactured or whether changes have to be made. If the design is determined to be in order then it will no longer be necessary to deploy a time-consuming visual simulation to identify potential collisions or conflicts.

When handling a cutting job for laser, punch or laser-punch combination machines, TruTops Boost also starts the nesting job automatically. Nesting algorithms have been refined so as to achieve a

marked improvement in sheet utilisation. At the same time TruTops Boost seeks sensible solutions for tooling, processing sequences and the routes traversed by tools.

When preparing a job for a press brake the software will work out a solution for the bending sequence, the positioning of the backgauge fingers, and equipment set-up. This innovative multi-solution technology automatically prepares a program that can be used with various press brakes. Additionally, a bending program prepared by TruTops Boost extends the uptime of the press brake as it is not necessary to create the program at the machine's control.

When working in HomeZone only three steps are necessary to progress from CAD geometry to NC program. In the first phase the user imports the geometry into TruTops Boost and enters the job data (such as production date, number of parts, customer and material) into the automatically generated job order. In the second step the system calculates automatically how the part can be made and prepares an 'unfolding' drawing. In the third step the software calculates the NC program for the machine selected by the operator.

Should a programmer or engineer wish to apply his or her own programming know-how for a particular job then the TecZone can be used and interactive programming or modifications engaged, and individual elements regulated.

Both operating levels (HomeZone and TecZone) can be used simultaneously, allowing for programming in the TecZone while the software itself, under HomeZone control, automatically calculates additional NC programs in the background.

An additional feature of HomeZone is that it allows the operator to review all of the jobs in storage. Intuitive search options help find and organise jobs and it is possible to call up jobs still to be completed or filter according to specific criteria such as material, target date or change date. The survey that shows which jobs have priority is also supported with warning messages if, for example, individual jobs have not yet been completed or if deadlines are approaching.

For further information contact Trumpf Limited, Unit A, President Way, Airport Executive Park, Luton, Bedfordshire LU2 9NL. Telephone: 0844 482 0188. Email: sales@uk.trumpf.com

OPTIMUM TOOLPATHS FOR MANUFACTURING COMPLEX SCIENTIFIC COMPONENTS

Scientific Manufacturing Solutions Limited are based near Swindon and produce parts for a variety of sectors including cryogenics, renewable energy, hybrid power and motorsport, as well as a number of science-based industries in Oxfordshire. Recently, however, they have, like a number of other organisations, had difficulty recruiting skilled machine programmers with Managing Director Craig Soubieski commenting that it "is getting impossible" to find engineers with the skills to program machines manually.

The solution to the problem was provided by Alphacam, a leading CAM solution for milling, routing, turning, profiling and wire EDM that supports entry level 2-axis through to 5-axis programming. In this case it was used to create optimum toolpaths for the complex manufacture of scientific components.

Director of Scientific Manufacturing Solutions, Dave Kimber, states:

"Many of our components are used for high-end experiments. We just wouldn't be able to machine them if we didn't have Alphacam. We generally receive new components as STEP files and sometimes as ParaSolid or IGES, all of which are easily imported into Alphacam. There's not much I can't get up and running within half an hour, even the 3+2 programs."

The features that need to be machined are taken from the CAD file to provide 100 per cent reliability and the confidence that what the customer supplied on the STEP file is what will be produced. One person can produce parts on seven machines, mainly, but not exclusively, in aluminium and stainless steel.

Mr. Kimber adds:

"It's allowed us to fill the shop floor with complex parts and still have the capacity to program them all quickly and easily. I program them, and the machine operator just has to set the machines to the tooling lists I send across."

Alphacam drives three Doosan mills, a Doosan lathe with C-axis, and a teach lathe. It has achieved an accurate and repeatable stable process on the Doosan DNM vertical machining centre for manufacturing a diverse range of complex parts for Diamond Light Source in Oxfordshire, including high-precision rails and magnet holders for a device that produces an electron beam that is used in a variety of scientific experiments. The Doosan (1270 mm X-axis, 650 mm Y-axis, 670 mm Z-axis) is equipped with an 18.5 kW 12,000 rpm 40 Taper spindle, a 30-position ATC and 1300 mm x 670 mm table.

Working on projects for around 20 customers at any one time, Craig Soubieski says that having the Alphacam 3+2 and turning packages has given the company the opportunity to invest in machine tools that can all be programmed swiftly and accurately, as opposed to continuing to attempt to recruit from a dwindling number of engineers with manual programming skills. He points out that a trainee with no prior knowledge can be trained to use it for simple parts in just one day.

Another major advantage is noted to be the avoidance of costly tool change collisions and in this regard Mr. Soubieski states:

"When we've produced a program for a component we run it through the simulator, and when we start to cut the metal the cutting tools always do exactly what the simulator showed us. So we have full confidence there won't be a crash, even on the 3+2 machining where the machine has to home to a certain position for the tool changes. If we were doing that manually there would always be the risk of an error causing a collision that smashes the tool change."

Scientific Manufacturing Solutions Limited were established in 2010 when Craig Soubieski and Dave Kimber identified a gap in the market for a specialist sub-contract manufacturer that could provide a total systems solution comprising of technical consultancy, advanced machining and manufacturing methods, and assemblies.

Alphacam were an exhibitor at Northern Manufacturing and Electronics and their contact details are:

Alphacam, Hadley House, Bayshill Road, Cheltenham, Gloucestershire GL50 3AW. Telephone: 01189 226 677. Email: info@alphacam.com

POST PROCESSORS DRIVE MACHINE TOOLS

T and G Engineering are a specialist manufacturer of form tools and components for the canning industry and for them the post processor is king as it allows the company to focus on challenging, complex and difficult to manufacture components as well as those with extremely close tolerances which improve the performance of the finished product.

T and G's wide ranging canning work includes aerosols, two-piece can tooling, chucks and rolls, and three-piece can tooling predominantly in hard metals, A2, D2, CPMs in the mid-60s on the Rockwell Scale, high speed steels, ceramics and carbides.

With a number of milling, turning and wire EDM machines from a variety of manufacturers such as Okuma Mulkus, Haas and Agie Charmilles, T and G Engineering are making increasing use of multi-axis machine tools and with this the ability to turn and mill in the same set-up is vital. The operation is noted to be much faster with twin chucks and multi-axis machining offers a clear advantage, but the programming was a challenge.

The company turned to Alphacam to address the challenge, using it to create toolpaths for between 2 and 7-axis machining work. CNC Supervisor Paul Marshall says that this allows the company to exceed customer expectations, especially on the Okuma Mulkus machines:

"Where people want a chamfer or just a break in the edge, we can put scanned radiuses on to corners. To put a 3D radius on a slot would be extremely hard manually, but Alphacam accomplishes it easily and quickly with minimal edits."

Owner Tony Smythe adds:

"Sometimes designers produce models that look good onscreen, but when we start interrogating them Part Modeler shows us things we wouldn't see otherwise. Once we start spinning, cutting and panning through it we can see corner rads that weren't visible on the drawing. Alphacam gives us better vision. Without it we could be several hours into a job before realising there's an issue. Models, as well as the post processor that allows us to accurately cut the metal, are definitely king with us."

He also believes that Alphacam's CAD/CAM functionality is changing the face of engineering:

"Different skills are required now, as we're running tools at rapid feeds and speeds. High speed machining has changed everything. The B-axis is extremely important for us, particularly on canning jobs with angled holes. Old-style turret machines simply can't compete, as it's a different turret position for every tool, but a twin spindle with B-axis means we can drill holes in any position with just one tool, and Alphacam simplifies the process. Even for boring bars, we just turn the chuck the other way round. One tool can do multiple operations."

Contact details: as above.

INTELLIGENT LOCKER WINS NUCLEAR INNOVATION AWARD

Exhibitors Quickvend Systems have gained a coveted winners award for SME innovation from Sellafield Limited for their intelligent locker system which is able to track and trace industrial equipment.

The prime advantage of the award-winning locker system is its ability to track not only the issue of an item, but also its return. This, coupled with the facility to indicate and control calibrated items using an innovative tri-colour LED recognition system, provides a simple, but robust solution.

The secure access control allows only approved personnel to withdraw items and the audit reports assist in identifying by whom, and where, the items are used. This saves the requirement to duplicate items (due to poor control) and avoids time-consuming searching for items by interrogating the readily available reporting suite.

The calibration feature also prevents out-of-calibration period items from being withdrawn.

Helen Turner of E.On Business Support states:

"Since implementing the Quickvend System machines we've seen a substantial reduction in day-to-day consumables such as adhesives, aerosols, batteries, small tools, etc. - in the region of 30 per cent - due to the Smart Card access and individual accountability that the system provides. Furthermore, the convenience that these 'point-of-use' machines provides has dramatically reduced the walk and wait times for our engineers to the main stores, which for a site the size of E.On is significant.

Our aim is to broaden the initiative site-wide, and specifically the control of essential maintenance tools using the Quickvend Intelligent Locker System where issues and returns can be tracked along with features such as Calibration Control and in-locker recharging stations for radios, cordless power tools and gas detectors."

Quickvend Systems are industrial inventory control specialists providing a range of hardware and software solutions for a broad variety of products such as high-value cutting tools, tool holders, calibrated items, gauges, PPE and MRO items.

Further information may be obtained from Quickvend Systems, Unit 5701 Shannon Place, Shannon Way, Tewkesbury GL20 8SL. Telephone: 0800 285 1552. Email: finlay@quickvendsystems.com

NUCLEAR FUSION REACTOR JUST ONE DECADE AWAY

Engineers at the Massachusetts Institute of Technology (MIT) have stated that with the aid of new commercially available semiconductors it may now be possible to build a fully operational nuclear fusion reactor within the next ten years.

Known as the ARC reactor, this would be a smaller version of the toroidal tokamak reactor currently under construction under the international fusion project Iter in Southern France.

The ARC (affordable, robust, compact) reactor uses rare-earth barium copper oxide (REBCO) tapes to form its components. These are claimed to produce a stronger magnetic field than the superconductors used in other tokamak designs (Iter uses niobium-tin and niobium titanium), which means that the reactor can be made smaller and would be cheaper to build. REBCO becomes superconducting at temperatures of around 90-100K as opposed to the 4K critical temperature of

the Iter magnets, enabling cooling to be achieved using liquid neon, hydrogen or nitrogen rather than liquid helium. Cryogenic requirements are therefore both simpler and cheaper.

Specially designed joints in the magnets allow the core of the tokamak (toroidal vacuum vessel) to be removable without the need to dismantle the entire device, which helps research and systems optimisation.

The 'blanket' (the component that faces the hot fusion plasma whilst also capturing the fast neutrons generated by the fusion process - which both allows the heat to be recovered from the reaction and also generates tritium, the radioactive isotope of hydrogen, which is one of the raw materials for fusion) is not a series of blocks as in the Iter. Instead it is composed of FLiBe, which is a mixture of lithium and beryllium fluoride that is circulated slowly and continuously around the inner walls of the torus at a temperature of about 900K. FLiBe is a proposed solvent for liquid fluoride thorium reactors (fission reactors that run on thorium rather than uranium).

It is envisaged that the ARC reactor will be able to produce about three times as much energy as it would take to sustain the fusion reactor, and this could be increased with further design refinements. The resulting reactor could then produce enough electricity to supply 100,000 people.

Further details in *The Engineer* (September 2015)

FUNDING FOR DEVELOPMENT OF NEW METHOD FOR LANDMINE DETECTION

Bath University has been awarded funding to further develop a new method for the detection of landmines.

The funding of £100,000 is to be provided by Sir Bobby Charlton's charity 'Find a better Way' and is to be used to pioneer a technique that will use a combination of 3D cameras and metal detecting technology.

Modern landmines are commonly made from plastic, which means that traditional techniques for identifying them are ineffective. The Bath University team is therefore looking to combine metal detection with new imaging technology using 3D cameras such that all types of landmine can be detected.

Dr. Manuchehr Soleimani, Associate Professor in the Department of Electronic and Electrical Engineering and Leader of the Engineering Tomography Laboratory at the University of Bath is quoted in *The Engineer* (September 2015) as follows:

"The innovative idea in this project is a combination of capacitive array and inductive array, so that both classification of electrical properties and detection of non-metallic and metallic landmines can be done.

The capacitive array works a bit like a touch screen and the inductive array is like a metal detector. We were able to develop 3D subsurface imaging in our lab and also able to do some initial feasibility tests representing simple scenarios of landmines in the lab."

NIKON METROLOGY TO TRAIN YOUNG ENGINEERS AT WARWICK UNIVERSITY

Nikon Metrology have announced that they are able to provide training to students at the Warwick Manufacturing Group Academy for Young Engineers in Coventry on one of their co-ordinate measuring machines, which is on loan from the Warwick Manufacturing Group at Warwick University.

The machine will assist students with verification and measurement when producing parts, ensuring that they are trained in the most efficient industrial processes and with the same equipment as that used by leading manufacturing companies.

The CMM will repeatedly measure to accuracies better than 10 micrometres and provide students with a quantifiable insight into both the accuracy of their parts and the capability of the manufacturing process used to make them.

Alex Atteridge, Project Manager for the Warwick Manufacturing Group is quoted in MTI Magazine (28 September 2015) as follows:

"Metrology, or the science of measurement, plays a critical role in any manufacturing process and yet it is a subject area rarely taught in detail, even at university level. Major players in the UK's high value manufacturing sectors, such as Jaguar Land Rover and Rolls Royce, are crying out for engineers with metrology skills and experience."

Nikon Metrology provide complete and innovative metrology solutions including co-ordinate measuring machines, optical CMMs, 3D laser scanners, hand-held laser line probes, x-ray and computed tomography, optical CNC measuring systems, measuring microscopes and large volume metrology systems.

Nikon Metrology were exhibitors at Northern Manufacturing and Electronics and their contact details are as follows:

Nikon Metrology, Argosy Road, East Midlands Airport, Castle Donington, Derbyshire DE74 2SA.
Telephone: 01332 811 349. Email: sales_uk@nikonmetrology.com