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Efficient, long-lived and low operating costs.

Centrifugal pumps are common in many industries, such as in vacuum cleaners and pumps for water, sewage and gas for example. Optimised centrifugal pump designs should meet three goals: maximum efficiency, prolonged life and reduced operational costs. To achieve their goals, design engineers use simulation analysis.

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comsol.blog/centrifugal-pump
EDITOR’S COMMENT

THE RUN-UP TO one’s 40th birthday can be a strange time. Like it or not, it’s a significant milestone and as such, inevitably tends to induce in one a tendency to look back and assess things.

Before you imagine this to be some sort of middle-aged lament on my part, I should point out that I am not talking about myself here. Not least because, sadly, my 40th birthday is some distance in the rearview mirror.

No, in fact the 40th birthday I am referring to in this case is not mine – or any person’s for that matter. It is this magazine’s.

The first copy of Eureka! hit desks in December 1980, featuring on its contents page a rather charming illustration of an inspired Archimedes leaping from his bath (presumably while uttering the eponymous exclamation). Happily, the artist chose to depict a relatively modest rear view of this famous event.

The history of this magazine might have been very different – and probably much shorter – had this wise editorial decision not been taken.

There are many things about this first issue that can seem quaintly old-fashioned, not least its extremely sparing use of colour. But it is important to remember that it is far too easy for the present to condescend to the past. In fact, putting any sense of quaintness aside, that issue set the ball rolling for a magazine that has now spent nearly four decades reporting on the latest technologies and inspiring engineers.

So, given that this anniversary falls in December, why am I writing this in January? Because this year will see us building up towards this anniversary issue and one thing I would like to do is to invite readers to suggest articles they have read over the years in Eureka! that inspired them and to tell us about it.

If there is an article that has appeared in this magazine over the last (nearly) 40 years that particularly sticks in your mind, let us know. Or if you just have happy memories of Eureka!, we’d love to know.

Paul Fanning, Editor

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A BIG YEAR

MISSION STATEMENT

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A BIG YEAR

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WE CREATE MOTION
RICARDO DEVELOPED THE engine for a JCB tractor, which Guy Martin powered to a Guinness world speed record with a top speed of 135.191mph.

While engineering a JCB Fastrac agricultural tractor, normally weighing around 8.5 tonnes, to achieve speeds of over 100mph was something of an unusual challenge, it was not without precedent. Much of the same Ricardo team was responsible in 2006 for the development of the two 750hp engines and supporting systems of the JCB Dieselmax Land Speed Record car.

Ricardo used cutting edge digitalisation methods to maximise performance, value and efficiency. These included using virtual reality for design reviews and creating a ‘virtual wind tunnel’ to help the engineers to collaborate remotely on aerodynamic optimisation.

The engine’s record-breaking performance was achieved by incorporating technologies such as advanced control, high-pressure common-rail fuel injection and advanced boosting systems, which are essential for low emissions, high fuel efficiency and high power-density engines.

“I would like to congratulate JCB, Guy Martin and the team on the fantastic achievement of the tractor world speed record,” said Stephen Dyke, MD of Ricardo Automotive & Industrial. “It was great to have a leading role in this project with the team at JCB and our fellow engineering partners.”

AUTODESK / ANSYS PARTNERSHIP

AUTODESK AND ANSYS have partnered to allow seamless interoperability between their products.

“Product ideation and quality is a team sport which can be hampered by engineering silos,” said Shane Emswiler, SVP and general manager at ANSYS. “This partnership dramatically improves workflows between our tools.”

As engineers use Fusion 360, their results are automatically available in ANSYS Mechanical for further refinement and validation. This is designed to improve efficiency in manual processes and can combine to enhance automated processes, like generative design, speeding time to market and enabling multiple engineering teams to work together.

Greg Fallon, vice president of business strategy and marketing at Autodesk, said:

“Our relationship with ANSYS connects our two companies’ complementary technologies and skills to strengthen our joint value proposition, drive expansion across more value chains and unlock value for customers.”
VEC awarded major nuclear research contract

THE VIRTUAL ENGINEERING Centre (VEC) has been awarded a contract to support Phase 2 of the Government’s Digital Reactor Design (DRD) nuclear research programme.

The £3.6 million project, funded by the Department for Business, Energy and Industrial Strategy, brings together experts from industry and academia to demonstrate cost savings from concept design, construction, operation and decommissioning of nuclear power reactors.

VEC, part of the University of Liverpool’s Institute for Digital Engineering and Autonomous Systems, will be working to further develop the digital framework to support future nuclear reactor build.

Konstantin Vikhorev, simulation team leader at VEC, said: “When delivering complex national projects such as this, systems integration is key. The framework provides an opportunity for project partners to combine their capabilities, it will ultimately offer an infrastructure for collaboration for organisations across the whole sector.”

Phase 1 of the DRD programme saw the development of a computer-simulated design and management platform. The focus of Phase 2 is to implement new tools and disruptive technologies in a digital framework, utilising real-life case studies and applications to demonstrate improved efficiency, enable supply chain collaboration and ultimately deliver cost-savings and a cultural change across the industry.

CUTTING AM PROCESSES BY 80%

MSC Software Corporation has announced MSC Apex Generative Design, a design optimisation solution that improves quality through the automation of design processes with embedded manufacturing knowledge.

The software aims to improve productivity by up to 80% compared to classic topology optimisation. It produces part design that is ready for additive manufacturing (AM) within a few hours, making reliable AM more cost efficient and accessible.

Hugues Jeancolas, VP product management, said: “We are integrating our structural analysis, design optimisation, and manufacturing simulation solutions to optimise and validate designs for additive processes before a single part is printed.”

In MSC Apex Generative Design, designers only need to specify the boundary conditions and design objective. Multiple designs that explore the possibilities of the design space will be produced that provide optimal stress distribution and minimise weight. This means designers have more time to optimise the product’s concept and integrate features that add value. Intelligent smoothing technology ensures that every design has a perfect finish that is ready for print.

HYMID EXPANDS INJECTION MOULDING CAPABILITY

Devon-based injection moulding specialist, Hymid Multi-Shot, has expanded its production capability with investment in an Arburg Allrounder injection moulding machine. The 440-tonne 4000 kN large class machine is the latest addition to Hymid’s line-up of injection moulding technology and part of a £300,000 investment programme.

MCGREEVY ENGINEERING INVESTS IN QUALITY

Precision engineering company, McGreevy Engineering, has purchased a high-performance CNC coordinate measure machine that supports manufacturing operations and allows it to meet global standards for key products. Additional training of employees has also taken place to ensure the high standards of quality for their growing aerospace customers is maintained.

SIEMENS ACQUIRES MULTIMECHANICS

Siemens has acquired MultiMechanics, Inc., the developer of MultiMech finite element software that helps to virtually predict failure in advanced materials. The company plans to integrate MultiMechanics into Siemens Digital Industries Software.

VEC DELIVERS £20M SAVINGS FOR SELLAFIELD

The Virtual Engineering Centre (VEC) has developed a cutting-edge mixed reality training tool for Britain’s biggest nuclear waste site, Sellafield, which will ensure the safety of workers in hazardous areas and save the organisation an estimated £20m. The VR crane training simulator allows Sellafield’s operators to learn to ‘drive’ the nuclear waste retrieval crane in a safe environment, ensuring greater levels of safety whilst increasing productivity.

INVESTS IN QUALITY

MCGREEVY ENGINEERING

INJECTION MOULDING

HYMID EXPANDS

CAPABILITY

CUTTING AM PROCESSES BY 80%
Moroder composes electric engine sound

TRANSPORTATION IS EVOLVING towards a silent future through alternative fuels and electrification, FPT Industrial has tackled this challenge by working with legendary electronic music pioneer and three-time Oscar winner Giorgio Moroder, to compose a new and original sound identity for its powertrains.

“The sound has to be as innovative as the engine is and has to fill the gap between the engine and the music,” said Moroder.

The artist has always been fascinated by the automotive industry: in the 80s he developed the Cizeta-Moroder V16T supercar with the engineer Claudio Zampolli and with legendary designer Marcello Gandini.

“We really want to give a voice and a soul to our engines, and I am sure it will be hard to believe what we are going to hear soon,” said Annalisa Stupenengo, powertrain president.

AUTOMATION REDUCES LEAD TIMES

IGUS HAS OPENED its automated assembly line for readycable at its Northampton facility. The line uses fully automated machines and lean manufacturing methods to streamline its manufacturing process to deliver fully harnessed drive cables shipped within 24 hours of order placement.

“A few years ago, our sole focus was on selling plastic bearings, energy chains and cables with little assembly work,” said Matthew Aldridge, managing director, igus UK.

“More recently we have stepped into robotics and automation based on our component parts and are now investing in automation ourselves to enable us to move into assembly within the UK.”

Historically, igus used to assemble cables manually by cutting back the outer jacket, teasing out the shielding, then stripping the jackets off each of the inner cores and adding crimps. Now these operations are fully automated using the readycable line, which also gives 100% quality of assembly.

“We have spent hundreds of thousands of pounds on machines to automate this process, cutting leadtimes from six or even 10 weeks down to 24 hours. Customers will usually receive their readycable the next working day, fully-tested with a guaranteed service life,” added Aldridge. “All this automation does not mean that we will be shedding jobs, this automated assembly line will enable us to grow our business, creating more jobs for the area.”
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MOTOR FOR YEAR-LONG UAV FLIGHTS

MOTOR DESIGN AND manufacturer Printed Motor Works was challenged to design the motors for the PHASAv35, an all-electric UAV intended to stay aloft for a year at a time providing low cost, persistent service for the delivery of 5G networks by the aircraft’s designers, Prismatic.

To meet Prismatic’s demanding specifications and deadline, PMW had to design a cutting-edge motor, drive and commutation system that would not overheat at take-off or during the fast climb necessary to reach the 65,000ft cruising altitude. The near space environment meant taking into consideration the ambient temperatures of -80°C and pressure of just 5.6 kPa. This required an understanding of the three-dimensional heat dissipation from the motor and adjacent components, while ensuring every motor, drive and commutation component selected was both mechanically and electrically rated for these conditions.

“Despite the project’s complexity, our leading-edge R&D meant we were able to deliver the motors to fit with the development and build timeline,” said PMW project manager, Ian Matthews Golledge. “It was a challenge pushing the envelope for this technology, but we knew our design team could do it.”

In creating the IR20E brushless DC motor, PMW shaved every possible gram from its structure and electromagnetic components without compromising efficiency, which was crucial in limiting power consumption so that the weight of the batteries and cables could be minimised.

SOLUTION TO LAST MONTH’S COFFEE TIME CHALLENGE

The solution to last month’s Coffee Time Challenge of how to invent a more effective bicycle light comes from Ireland in the form of the Kogii light. This smart light senses the ambient lighting conditions and adjusts its brightness in order to maximise the cyclist’s visibility.

In practical terms, this means that the light is brightest during the day for maximum effect and dims at night to avoid dazzling people while still adequately illuminating the way ahead. In addition, the light incorporates proximity sensors, enabling it to detect vehicles that trigger the light to flash dynamically if they get within a dangerous range of the cyclist. It can also detect the cyclist braking and illuminates like a car brake light.

The data from the light’s sensors is stored and the anonymous information gathered can be used to analyse traffic patterns and road safety factors from a cyclist’s perspective by analysing how the cyclist moves in conjunction with their external environment. This is then combined with known locations of previously reported crashes and fatalities to further verify the analysis and predictions.

Magnetic particles enable shape-changing material

RESEARCHERS FROM THE Georgia Institute of Technology and The Ohio State University have developed ‘magnetic shape memory polymer’, a soft polymer material that uses magnetic fields to transform into a variety of shapes. The material could enable a range of new applications from antennas that change frequencies on the fly to gripper arms that can lift 1000 times their own weight.

The material is a mix of three ingredients: two types of magnetic particles, one for inductive heat and one with strong magnetic attraction, and shape-memory polymers to help lock various shape changes into place.

Jerry Qi, professor of mechanical engineering at Georgia Tech, said: “This is the first material that combines the strengths of all of these individual components into a single system capable of rapid and reprogrammable shape changes that are lockable and reversible.”

The new material builds on research that outlined actuation mechanisms for soft robotics and active materials and evaluated the limitations in current technologies.

“The degree of freedom is limited in conventional robotics,” said Ruike Zhao, assistant professor in the Department of Mechanical and Aerospace Engineering at Ohio State. “With soft materials, that degree of freedom is unlimited.

“This process requires us to use magnetic fields only during the actuation phase. So, once an object has reached its new shape, it can be locked there without constantly consuming energy.”
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EMS-GRIVORY successful again at the SPE Award Night

At the 19th SPE Award Night on 14 October 2019, the International Society for Plastics Technology once again presented its coveted awards for the most innovative plastics applications in the automotive industry. Three applications made of EMS materials were in the race for the prestigious awards and all three were awarded!

1. «Powertrain»
   - Active Cooling Valve

2. «Electronical/Optical Part»
   - Design Remote Key

1. «Electronical/Optical Part»
   - Illuminated Handle
Polymers in medicine
Grilamid TR – Crystal clear transparency, Chemical & Stress crack resistance, Dynamic strength and fatigue resistance

Innovative materials for medical applications these products are transparent high-performance polyamides containing no BPA. Due to their high resistance to chemicals, Grilamid TR products from EMS exhibit no stress cracking with outstanding resistance to hot water, hydrolysis and breakage contributing to a longer working life for medical applications.

With the EMS know-how, the first transparent polyamide worldwide has been developed which is suitable for repeated steam sterilisation Grilamid TR FE 11292 can be used for multiple medical and healthcare products.
Four years ago, Airbus used generative design to create a partition that separates the cabin and the galley in its aircraft that was half the weight of the one it replaced. This could, potentially, save around half a million tons of CO₂ a year if rolled out across all A320 planes. Generative design creates thousands of design options that eventually lead to the lightest, strongest single-part components that are made using the least materials possible.

Bastian Schaefer, innovation manager at Airbus, says: “We’ve been using metal 3D printing with an aerospace material called Scalmalloy to create a full-scale partition which is almost 50% lighter than the existing design. This component has been tested successfully, it’s not flying yet, but it has taken the first steps towards certification.”

A revised version of this partition, ‘Bionic Partition 2.0’, is being built, originally the intention was to fabricate the new partition using metal additive manufacturing. But, due to a range of variables in the manufacturing market and materials requirements, it became clear that an alternative fabrication process would be necessary. Autodesk’s generative design technology has continued to mature and is now capable of optimising for multiple advanced manufacturing techniques during the design phase of product development.

This meant Airbus could use generative design to create a plastic, 3D-printed mould for the partition, and then cast the part in an alloy that’s already qualified for flight. Bionic partition 2.0 is just as strong and light as its predecessor and Airbus has moved from developing components for the cabins of its aircraft interiors, to exterior components and even the factories in which these components are built. Tom Austin-Morgan reports.

“We managed to reduce the distance of the key travel paths while also minimising congestion and bottlenecks.”

ANDREW ANAGNOST
Due to the triangular shape of the plot of land on which it is to be built, Airbus used generative design techniques to design the most efficient factory floor possible within this footprint.

DESIGNED FACTORY

can be fabricated at scale more affordably.

“The revised design makes the bionic partition much more viable for production. The first prototype is in production, which we hope to finish before the end of the year,” says Schaefer. “The process and technology have evolved to where we can now manufacture multiple units at a considerably lower cost.”

From this, Airbus moved on to optimising critical exterior components like the nacelles for the engines and the vertical tail plane (VTP). The purpose of a VTP (or vertical stabiliser) on an airplane is to provide directional stability and reduce aerodynamic inefficiency caused by side-to-side movement. Generative design is enabling the team to evaluate hundreds of design alternatives that all meet objectives for VTP stiffness, stability and mass. The leading edge of the VTP has been 3D printed from metal into a lattice structure that is incredibly stiff, as light as possible and resistant to impact.

**VR TESTING**

This same design principle is beginning to be applied to the leading edges of the wings too. But generative design is much more than topology optimisation of parts, it can also be used to tackle complex engineering, architectural and systems challenges.

“All of this grew out of the work Airbus and Autodesk did four years ago,” says Andrew Anagnost, CEO of Autodesk. “And today, we are working together to figure out how automation could help Airbus with a much bigger challenge. From their early work on structural optimisation, they’ve shifted their focus to systems optimisation, from parts like these to the processes that go into making them in factories like the one in Broughton, UK, where the A350’s wings are assembled.”

The assembly line involves a lot of human labour: drilling, cleaning, bolting, riveting, sealing, 24 hours a day in three shifts, and all these different tasks require different tools. Going back and forth between the wing and the tool trays, the carts and the storage racks involves a lot of walking. And while this walking might feel like work, it isn’t really work at all, it’s simply activity. »
“We helped Airbus see how one bay could be configured for multiple wing types,” Anagnost continues. “They use generative design to explore how tools, locations and configurations could be optimised for this process, as well as all the processes from all the variations of the wings for the different generations of the A350.

“We managed to reduce the distance of the key travel paths while also minimising congestion and bottlenecks. Now, the line workers are absolutely getting in their daily steps, but they’re also spending more time assembling the wings, it’s a more productive factory and more configurable factory.”

This was essentially just a proof of concept for something much bigger. Airbus is now using generative design to optimise a new factory for painting and assembling A320 engines in Hamburg, Germany, that is due to open next year. The goal is ultimately to assemble engines more quickly with more efficient logistical flows and a more content workforce, in a factory that is expandable and adaptable to meet Airbus’ needs both today and in the future.

The reason Airbus has used generative design to design a whole factory is because the remaining plot on the edge of its campus is triangular and smaller than Airbus would like. So Airbus explored two paths, one examining what a bigger building with a triangular footprint might look like, and the other how the same factory might be optimised to fit into a smaller, rectangular footprint. Ten different sets of variables were identified to optimise for; these covered the social, environmental, financial and operational aspects of the design.

The social aspects of the factory were a key consideration as Airbus wanted the best conditions possible for its workers. They also wanted a building with the best possible environmental certification. But the factory needed to be affordable as well as sustainable. So, Airbus considered the major financial drivers, the number of unique structural members, the length of these members, and the building’s overall footprint.

Cost matters to everyone, but what’s critical to Airbus was the way the factory operated. So, they looked at the operational drivers, different flow paths through the factory. The software plotted lines representing the logistics flows (loading and unloading and prepping and inspection), jacking, jiggling and the many parts that need to be assembled, and where and how these parts would be moved to and through the different paint booths.

“The generative design system learned over time how to achieve better scores,” explains David Benjamin, head of The Living, an Autodesk Studio. “After identifying the options that were best and mathematically solving this 10-dimensional problem, we further filtered the designs to show only the super, super optimal ones for the most critical goals which were production efficiency and construction costs. Then we worked with the many project stakeholders for this factory to select the best triangular design option and the best rectangular design option.”
Where Industry and Innovation converge

Meet over 800 national and international suppliers at the Farnborough International Exhibition & Conference Centre this February at Southern Manufacturing & Electronics (inc AutoAero) 2020. See live demonstrations and new product launches of machine tools & tooling, electronics, factory & process automation, packaging & handling, labeling & marking, test & measurement, materials & adhesives, rapid prototyping, ICT, drives & controls and laboratory equipment.

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

The exhibition is free to attend, free to park and easy to get to. Doors open at 9.30am on Tuesday 11th February.
Both have better flow scores than the existing standards, so either factory functions more efficiently, the engines are installed more quickly, the logistic flows are more efficient, and so are the workers because they take fewer steps each day.

Airbus and Autodesk made a ‘baseline’ factory design created with the typical rules or form and formula to compare the generatively designed options against. Overall, the triangular factory scored 40% better than the baseline. The rectangular one has a smaller footprint, which means that it fits squarely on the constraint side. Both options are less costly.

“In addition to having greater production efficiency and lower construction costs than a typical factory building, these designs are also better places to work,” Benjamin continues. “And they’re extremely sustainable with features like natural ventilation – there’s no active air conditioning in this building – as well as great daylight, renewable materials and even net zero concrete, which translates to lower energy consumption, lower carbon emissions and better outcomes for Airbus.”

Schaefer adds: “Generative design is helping us create a more sustainable architectural design that better accounts for critical human factors and work conditions. It has also expanded our way of thinking and our approach to design by overcoming preconceived notions and blind spots. Whichever design we choose, we know the factory will function more efficiently and will be less costly to build.”

David Benjamin
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There are big discrepancies in the reporting of how technology and automation will affect our futures, especially around jobs. The mainstream media tends to publish headlines that warn of automation taking jobs from humans, whereas technologists are more evangelical about the future. “Maybe the truth lies somewhere in between,” Anagnost conceded. “Because, although technology can be a positive force, there are forces pulling us in other directions. On the one hand, we know that a growing population is inevitable – as is a world with more automation – because so much more is needed. But at the same time, we fear there will be less jobs and less of our planet’s scarce resources.”

What do we know about the future with any certainty? Anagnost said that more and more people are joining the middle class every day, over half the global population in fact. “I know there are many definitions of what middle class is,” he added. “Whatever your definition, the fact that 4 billion people enjoy mobility and prosperity is enormously good news. But with this increasing prosperity comes increasing demand. For more housing; hotels; more automobiles; and more airplanes. We know that more is inevitable. As we make more things for more people, we also know that we create more potential for negative impact. Making all we need with less harm to the planet and people is a reality that we all need to face up to.”

How can companies like Autodesk help solve problems of such enormity and complexity? “It’s a massive challenge, but it’s also a massive opportunity,” Anagnost said. “There are three areas I think we all have an impact on, and they’re all completely interrelated.

First, we have the opportunity to better use the world’s energy and materials. Using less is part of it, but it’s also about better: more renewable energy and more circular materials. Better is also about the health and resilience of the entire population, that means designing products without harmful materials that compromise our safety, or using supply chains that compromise people, it means designing buildings that prioritise health and well-being, and designing cities that are resilient in the face of climate change.

Finally, we all know that automation is changing jobs. But it’s also creating the opportunity for more meaningful work, better work, and a path to prosperity for more people. Together, we have an opportunity to create a more sustainable, more equitable, and more prosperous future. A future that’s better for the growing middle class, but also for those still striving to get there.”

One of the areas in which Autodesk is working to reduce waste is in the construction industry where it is helping Marriott to build modular hotels, combating a shortage of construction staff. Over the last five years Marriott has built 30 low-rise properties, but this year will open the world’s tallest modular hotel. The 26 storey Nomad hotel in Manhattan, New York. Each of Skystone’s hotel rooms is a single, self-contained module that has been built and fitted out in a factory using the exact amount of material needed.
York, has been built in conjunction with Skystone, a company that specialises in modular buildings.

Each room that makes up the hotel is a single, self-contained module that has been fully fitted out in a factory in Poland using only the exact amount of material needed. The whole hotel – 168 modules – is then shipped to the Port of New York and then transported by truck to the site where they are craned into place on the central concrete core and hooked up to the facilities.

Anagnost stated: “Over half the work is still done on-site, but the work has changed for the better. It’s simple, it’s predictable. But beyond that, there’s also less disruption to the neighbourhood: less noise, less dirt. Because of the building’s performance, Marriott qualified for a floor space credit, the city granted them an extra 5500ft² that will become a rooftop bar which will make it more attractive, bring more guests, and more revenue.

“Maybe you’re not building high rise hotels, but if modular can do this for Marriott, just imagine what it could do to help you use energy and materials more efficiently.”

ANDREW ANAGNOST

some way to help towards by donating $500,000 at the event.

“Technology helps us create a more prosperous future,” Anagnost said. “But we need to create better experiences for people as well.”

Nowhere is this more evident than at Disneyland’s newest attraction, the 14-acre Star Wars: Galaxy’s Edge site. One of the major attractions here is the Millennium Falcon, which is not just a replica of the set, but an interactive experience and the result of over 600 different models all integrated in a single source, encompassing design, fabrication and installation.

There were two major constraints that drove its design: the structure and the interface with the ride system. The site footprint drove the overall shape of the building and the ride system occupied a big portion of the floor space. This left odd-shaped voids into which all the show set spaces had to be located. The design needed to be coordinated with incredibly small tolerances because fractions of an inch is the difference between a snug fit and an HVAC duct running right through the middle of the ship’s holographic chess table.

The show set, ride and facility teams were in different locations working on their respective designs concurrently. Coordinating electrical, AV, fire protection and show control systems was an iterative process with the design evolving over time as each discipline put more detail into the model, which pushed Revit to its limits.

But working together concurrently rather than sequentially meant that the attraction opened earlier than planned.

“Organisations like Skystone, Build Change and Disney Imagineering are starting to see the value that is emerging from building on our platform,” Anagnost finished. “Think about how automation can help you connect the disciplines you work with, look for opportunities to eliminate the non-productive. Think about how you can grow your expertise and your creativity and focus on what adds value to you and to your business.

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Understanding the specific needs of the armed forces can be difficult for even the best ‘civilian’ technology architect to tackle, however Logimatic, a leading system integrator had extensive experience working with the Navy. Together with long-time ally Rockwell Automation, they faced the first of the Danish Naval flexible support vessels when it arrived into dry dock for a complete technical overhaul.

They knew they would have to not only think and act like they were sailing the high seas themselves, but to push the boundaries of marine technology.

Built in 2003, the Danish Navy ship HDMS Absalon (L16) was scheduled to have its automation and remote-control system completely replaced after a 15-year lifespan. The situation called for nothing less than a complete modernisation of the ship’s entire technical infrastructure.

Running the ship’s outdated ‘thick’ system was not only excessively expensive to maintain, but in many cases had become so obsolete that it was no longer updatable. User terminals around the vessel with banks of screens controlling different functions such as fire management, warning systems, camera monitoring and alarms had become a labour-intensive task to maintain.

It had become critical to overhaul this aging infrastructure to confirm that serving naval personnel could access the right application from the right location at the right time, with a modern visualisation system which would not only improve the user experience, but also to save time and potentially save human lives.

“Clearly the ship’s technical abilities were antiquated and needed to come into line with more modern capabilities,” explains Mathias Jensen, project engineer, Logimatic. “The Danish Navy was keen to find new flexible, yet resilient, solutions for their personnel which could be easily implemented and activated.”

Logimatic knew the situation required a leaner system that would connect the entire vessel in a way where content could be managed, delivered and shared with terminals anywhere across the ship via any crew member.

However, demonstrating to the Danish Navy that this system was the best plan of attack was not as easy as a standard pitch. So Logimatic decided to go the extra mile – it custom built a dedicated, fully operational proof of concept lab where their proposed systems could be tried and tested first-hand.

**THINMANAGER**

After in-depth consultations with the navy, including time spent inside the lab, Logimatic’s recommendation was to design and implement ThinManager, the simplified technical architecture from Rockwell Automation which simplifies management of hardware, applications and visual sources.

Having been impressed with much of the pre-work performed with ThinManager during this consultative process, navy personnel readily agreed to set sail.

“We spent a huge amount of time together with the Danish Navy inside our concept lab, constantly reviewing designs and trouble-shooting potential issues” continues Mathias Jensen. “We knew that we would...”
have a limited amount of time on the ship itself, so it was critical that all parties felt comfortable with our plan. The concept lab was an excellent way to do so.”

Once the project was officially given the green light, it quickly became necessary for Logimatic to go beyond the land locked lab and set out to sea with the ship’s crew, regardless of the 20-year history working with the Danish Navy. They needed to gain a stronger first-hand understanding of the pain points, naval requirements and best-case solutions required for ThinManager implementation.

Everything considered standard practice with civilian clients went overboard when the Logimatic team began working directly with the crew of the naval support ship. Seemingly simple issues such as switching between screens, pressing a button or even the size of a standard mouse needed to be considered as a potential matter of life or death.

By gaining a deeper level of understanding and appreciation of the conditions that the IT infrastructure would need to perform under, the Logimatic team developed a specifically tailored ThinManager solution. Purpose designed software was programmed into carefully considered hardware, with multiple sources integrated into single display terminals instantly capable of reading and reacting to constantly incoming data from all over the ship’s IP cameras, FactoryTalk View SE SCADA system and other third-party software packages.

Once the initial system was installed, the Logimatic team continued to sail with the Danish Navy onboard the newly refitted HDMS Absalon (L16). Testing and refining the infrastructure in real life scenarios throughout Norway and Scotland allowed for a collaborative effort to hone systems, hardware and protocols.

What was a heavy system of aged hardware and countless sub-systems had been upgraded with customised server-based software and virtual machines at each user terminal. Easily accessed by assigned personnel and seamlessly delivering the content that is most relevant to each situation, the HDMS Absalon (L16) had taken a giant leap forward from its fifteen-year-old self that had been hoisted into dry dock only months earlier. So much so that sister ship HDMS Esbern Snare (L17) was quickly approved for a complete technological overhaul.

“Any unforeseen downtime at sea can be dangerous, especially in potential combat situations,” shares Søren Præsius, project manager, electrical power and automation, Danish Ministry of Defence Acquisition and Logistics Organisation.

**LIFE OR DEATH**

“Having the ability to work on terminals with a consistent, lightning-quick speed can literally be a life or death situation. Our crew members are now empowered to quickly act, under any level of stress, with a system that is consistent and intuitive to use.”

Lowered cost of operation is also one of key benefits the Danish Navy has experienced as a result of the ThinManager implementation. Excessive and expensive-to-maintain hardware has been removed in place of more modern, efficient controls together with HMI software. ThinManager is also scalable to allow for any number of adaptations and necessary changes over the coming years, which translates to a reduction in costs especially when compared to the legacy system.

Security in any armed forces is paramount and nothing more so than a naval vessel at sea or dockside where all precautions need to be taken against malfunctions and the threat of outsiders bringing computers or USB’s onboard for example. Logimatic implemented the ThinManager system to employ the highest of security measures. While the new system is still an ‘open system,’ the architecture makes executing protective means far more efficient and effective.

“We’ve seen a very positive impact on the entire Danish Navy via of this project,” says Præsius.

“The new technology provides a blueprint for improvements to be made throughout the rest of our fleet. The successful upgrades to both HDMS Absalon and Esbern Snare has paved the way for enhancements to three of our Naval frigates. We’re looking forward to seeing what else we can accomplish together.”
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Traditionally, torque wrench calibration machines have been intended for specific manufacturers' products. For laboratories and OEMs this can be a real nuisance, requiring several different machines to cover each torque wrench manufacturer; which can be expensive and takes up a lot of bench space. For this reason, a truly universal calibration machine is a godsend.

Which is why Advanced Witness Systems Ltd (AWS) sought to design just such a machine. The design project, which took only 18 months to complete, enables AWS to offer calibration accredited laboratories and large OEMs the most advanced and truly universal torque wrench calibration machine in the world.

Based in Banbury, Oxfordshire, AWS is a designer of torque transducers, instrumentation control systems, calibration apparatus and certification software programs. Its pedigree traces back more than 40 years to managing director Ron Sangster who has been involved in developing national and international torque standards as well as national standard calibration machines. While consulting for the National Physical Laboratory he designed the Master 2kNm Torque Calibration Machine, which has been proven to be one of the most accurate torque calibration machines in the world.

Sangster’s aim therefore was to develop a truly universal machine, able to meet the ISO6789:2017 manual torque tool standard, that would be able to guarantee the absolute and consistent accuracy of any torque wrench, be it a tool for use with bone screws used in prosthetic surgery, a click torque wrench for tightening a car’s wheel nuts or a torque wrench used for aviation, construction and heavy machinery assembly. He also wanted the machine to operate quietly and require as little maintenance as possible. “Technicians appreciate using quiet equipment in their labs, unwanted background noise can be annoying,” he explains. “They also do not want to have to regularly maintain their equipment – long life and high reliability are therefore other key criteria.”

During this development process, AWS turned to igus for its low friction plain bearing, drylin E linear drives and e-chain ranges. “We received a high level of technical support from igus, as well as many samples from the igus iglidur bearing, drylin E linear drives and e-chain ranges, to realise the initial design concept for the machine,” adds Sangster.

The development of the world’s first truly universal torque wrench calibration machine has proved a considerable success.
He explains that initially the focus was to accommodate torque wrenches requiring forces up to 50kg applied to the handle, but during the 18-month design project discovered ones that required a mammoth 110kg force. “We needed to beef up the machine dramatically, the original drives could not cope and there was too much friction on the bearings. To overcome these issues, we worked with igus adding in a gearbox, larger linear crosstrack and modifying the bearings.”

The result is the AWS Universal Torque Wrench Calibration Machine (UTWCM), which provides an efficient and cost-effective means of calibrating and testing manually operated torque wrenches to international or company specific standards and specifications. It is designed to calibrate and test wrenches up to 2,500 Nm and equivalents. The benefit of using the machine is that it removes the need for operators to manually apply, at the right speeds, high forces when calibrating large torque wrenches. Instead, the machine applies the force using AWS proprietary firmware, a stepper motor and linear guide system.

Available with either semi- or fully-automated operation, the UTWCM applies the force to the tool via a linear carriage stepper motor and a proprietary microcontroller. This set-up assists in minimising the parasitic forces applied to the torque wrench handle. The machine can be used with the latest AWS Kepler software, Kepler 4, to speed up completion of the calibration and certification process to comply with ISO 6789:2017, ISO 6789:2003 or type approval requirements for manufacturers.

“Parasitic forces acting on the wrench during calibration are reduced by design feature and easy to adjust force balancer systems to counterbalance the weight of a torque wrench handle.”

The fully-automated UTWCM uses AWS Intelligent Inline Torque Transducers (IITTs) and the AWS Professional Transducer Display (PTD) to provide feedback to the microcontroller, automatically detecting a first peak signal for setting type wrenches, stopping the machine and returning to zero, greatly speeding up the calibration process and reducing operator input. With indicating wrenches, the operator stops the machine when the torque wrench displays the target torque. An optional Transducer Switch Box keeps AWS IITTs powered up continually, allowing quick changeover between transducers.

The semi-automatic version relies on the operator to instruct the machine as to when 80% of the target torque has been reached, so that the machine slows to the correct rate, and to stop the machine when the target torque is reached.

The built-in microcontroller controls the accuracy of the load applied and operation speeds of which there are four settings for different ranges of tools. This ensures the adherence to the minimum target torque approach times, complying to the ISO standard, for the capacity of wrench being calibrated. Multiple safety features ensure that the machine, transducers and torque wrench are not overloaded in operation or over driven due to a wrench fault.

Parasitic forces acting on the wrench during calibration are reduced by design feature and easy to adjust force balancer systems to counterbalance the weight of a torque wrench handle. Multiple or single transducer cassette variations for different transducer manufacturers are available or built to suit customer requirements. “To accommodate wrenches with fixed heads, the transducer mounts in our carriages can be rotated 360° in steps of 30°,” adds Sangster.

Since the launch of UTWCM, the company has sold all that it has built so far, with new orders coming in quickly. Calibration accredited laboratories and large OEMs in various sectors, including aerospace and defence, subsea, transportation, power generation, production plants and processes, around the world are discovering the value of using a truly universal machine. The benefits of the UTWCM being automated, reliable, maintenance-free, quick and easy to use, energy efficient and quiet are proving highly desirable.
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The challenge of facilitating the adoption of additive manufacturing (AM) is one that faces all of industry. With this in mind, it is not surprising that Siemens is making particular strides in this direction.

This began with the official launch and general availability of the Siemens AM Network, following pilots and successful implementations with customers and partners, including Decathlon, Siemens Gas & Power, Siemens Mobility, HP and Materialise.

The Siemens AM Network provides an advanced cloud-based solution to foster collaboration and process orchestration between engineers, procurement and suppliers of 3D printed parts. Providing an end-to-end digital process that connects the demand for parts with a supplier network helps enable globally distributed manufacturing.

Siemens’ AM Network is designed for enterprises, suppliers and partners that are looking to accelerate the adoption of AM for industrial processes and applications. It digitalises the order-to-delivery process by aligning the engineering and commercial processes for high-quality AM functional prototypes and serial production parts. The system connects buyers with a global supplier network which streamlines the process, fosters collaboration and engagement, and orchestrates the workflow to increase throughput and reduce operational costs. As part of the Siemens’ suite of Software as a Service (SaaS) solutions, the AM Network meets the most stringent requirements for security, availability and regulatory compliance.

AM NETWORK

“Siemens’ AM experts and industry veterans have developed the additive manufacturing network based on a clear understanding of the complexities and needs of the industry, fostered by a sincere passion to promote the adoption of AM in the industrial domain,” said Zvi Feuer, senior vice president manufacturing engineering at Siemens Digital Industries Software. “As buyers, sellers and partners continue to plug into the ecosystem, they will find a streamlined, modular solution that can grow with each company’s individual needs.”

Early adopters are already realising the benefits of the AM Network. Decathlon, the largest sporting goods retailer in the world with over 1500 stores in 49 countries, uses the AM Network to manage its AM ordering process and control production progress as part of its strategy to scale its use of 3D printing globally and ramp up production, while maintaining high standards of quality. At Siemens Gas & Power, the AM Network is helping the business to be more agile and respond to inquiries in real time to help ensure customers get exactly what they ordered, on time.

“We have full confidence in the AM Network to help us facilitate a smooth flow of information among the various functions within the organisation,” said Andreas Graichen, group manager, AM industrialisation and digitalisation, Siemens Power & Gas,
Service Distributed Energy. “It will also allow us to effectively connect to our external customers, while providing a detailed outlook on costs and production time from beginning to end.”

COLLABORATION

Another notable collaboration in this regard is the strategic collaboration between Oerlikon AM, the additive manufacturing unit of technology group Oerlikon and Siemens AG.

The agreement will see Siemens supply Oerlikon AM with digital enterprise solutions that will help the Switzerland-based company accelerate AM’s industrialisation.

The integration of Siemens’ digital expertise portfolio in Oerlikon’s software landscape in its AM and R&D sites will support Oerlikon in actively managing the AM process from end to end using one interface.

“At the moment we have a variety of special tools that we use for different steps of the value chain,” said Dr Sven Hicken, head of Oerlikon’s Additive Manufacturing Business Unit.

“Developing a more integrated system that gives us increased visibility and puts all of our manufacturing sites on the same page will allow us more flexibility and speed in responding to customer requests.”

The two companies will begin by focusing on tools used in the engineering part of the AM process. The project is expected to take approximately two years to complete, but individual models will go into operation when completed.

“Oerlikon has extensive expertise in the AM process,” said Dr Karsten Heuser, vice-president of additive manufacturing for Siemens Digital Industries. “We know we can learn from them and are excited by the opportunity to use our technology to enhance their productivity. Working together, we believe we can make a major impact on industry’s adoption of AM.”

From a software point of view, Siemens Digital Industries Software has also announced AM Path Optimizer, a beta technology integrated in NX software, to help customers solve overheating challenges and help reduce scrap and increase production yield to achieve the industrialisation of AM, or the use of AM at the industrial scale. Siemens has developed this next generation advanced simulation technology to help maximise the production yield and quality of powder bed fusion manufactured parts. This latest extension of Siemens’ end-to-end AM solution feeds the digital thread, informing each step of the industrialised AM process.

“Building on the Simcenter Additive Manufacturing Process Simulation solution announced in November 2018, AM Path Optimizer complements Siemens’ strategy for the digital twin of the manufacturing process and addresses errors originated from suboptimal scan strategies and process parameters. These can lead to systematic failures due to overheating, which can cause scrap and inconsistencies in component quality.

FIRST TIME RIGHT

Siemens has had success demonstrating this beta technology with Trumpf as a partner. “With the AM Path Optimizer, Siemens and Trumpf can push industrialisation of additive technologies further forward,” said Jeroen Ruse, AM Expert at TRUMPF. “In our demonstrations we saw an improvement of geometrical accuracy, elimination of re-coater errors caused by overheating, as well as a more homogenous surface quality. Also, the scrap rate is expected to be reduced significantly.”

The technology uses an innovative approach combining physics-based simulation with machine learning to analyse a full job file in a few minutes before execution on the machine. This technology is expected to help achieve ‘first time right’ prints and drastically reduce trial and error. It can also help reduce printing costs and enable the printing of components that are nearly impossible to achieve today.

“AM Path Optimizer is the latest innovation in Siemens’ end-to-end AM solutions, and one that we feel will have a great impact on the use of AM for powder bed fusion manufactured parts,” said Feuer.

“The combination of NX for AM and our Simcenter AM technology within the Xcelerator portfolio provides our customers with key capabilities to assist manufacturers in designing and printing useful parts at scale, which is unmatched in the market.”
Love it or hate it, live with it or without it, plastic has come a long way from the Bakelite resin patented at the turn of the 20th Century that revolutionised how many consumer goods were mass-manufactured. Lightweight, durable and easy to work with, like many resins today, it could be moulded into an infinite number of shapes.

So, how do you go about selecting the best, most sustainable plastic for your moulding venture today? With more than 85,000 listed plastic materials, and more than 45 polymer families, Thomas Catinat, production manager at Broanmain Plastics, explains some of the common compositions and characteristics of materials that start in pellet form and why, for the sake of ecology, we should learn to respect its purpose and consider innovative ways to upcycle, recycle and keep plastic out of the waste stream.

**BACK TO BASICS**

Plastics are essentially atoms that are grouped together to form molecules called monomers. These monomers link together to create polymers. That’s why ‘poly’ features in so many plastic materials names.

Polymer all offer varying degrees of strength, resistance, elasticity and even special features such as antibacterial or UV protection. The choice will depend on the application, for example if it needs to withstand high or extremely cold temperatures.

Narrowing the choices down can feel daunting. Although most customers know what they want, an experienced moulder can make recommendations based upon the environment the component is being used in, and help customers to consider other usability factors, such as slide action.

**MAINSTAY MATERIALS**

Polypropylene (PP) is generally deemed the most versatile and popular material for most applications. It has a fairly high melting point, can withstand daily wear and tear and is resistant to cracking and stress, even when flexed. For this reason, it’s often used in packaging applications, such as snap on lids, bottle caps, or medical tubing.

When replacing metal components with plastic, PP can be used to reduce weight providing the component won’t be put under a high level of stress. When high mechanical resistance is needed, a stronger polymer, such as nylon or a glass fibre filling might be used.

Another good feature of PP is, like other thermoplastics, it can be melted down to create new products. For example, car parts, storage boxes, plastic pallets and even garden furniture.

Acrylonitrile Butadiene Styrene (ABS) is also relatively inexpensive and has good impact and chemical
resistance. For this reason, it is often used for visual parts, such as computer keyboard keys, televisions, plug sockets and even children’s play bricks.

Standard ABS is usually mixed with the most appropriate additives to make them cleaner, safer, stronger and shinier. Common examples include colour pigments, anti-static agents and heat stabilisers.

Polyamide nylon (the most common PA66) has a very good chemical resistance and can be used as another replacement for metal in applications that require high strength, toughness and weight reduction, for example automotive parts. However, it’s worth keeping in mind that nylon plastic can absorb moisture, which in softer polyamide products can affect the dimensional stability.

Polycarbonate (PC) was used to make the astronaut helmet for the Apollo landing in 1969. In everyday applications today, its low weight, impact resistance means that the material is used for parts that require clear lenses or windows, from car headlamps to visors, medical device cannulas and cell phones. PC is also used in a lot of safety gear used by professional sports athletes, such as the outer shell of ski helmets. Acrylic (PMMA) is an alternative, although the material is not as strong as PC.

**ECO-OPTIONS**

With such a focus on sustainability and reducing plastic consumption, customers invariably ask about the moulding properties of bio-based materials. Although the cost of bio-based materials is gradually coming down, the price currently remains higher than fossil-derived polymers. There remain lots of developments in this field. And for many right now there are too many unknowns, including questions surrounding the true sustainability of harvested bio-based crops, such as corn.

For recycled plastics, the jury for many customers is also still out. Most prefer to source a pure polymer and don’t accept regrinds, as they are concerned that product performance will be compromised. From a scientific perspective, every time plastic is melted the molecular structure changes and degrades. Some call this a “heat history”. The more this happens, the weaker and more brittle the part gets. In time this can affect the characteristics of the end product, potentially compromising safety, hygiene or performance.

If using regrind it’s advisable to minimise the blend to 20% or less. Do remember that any subsequent pass through the machines will contain some of the previous regrind blend, so the ratio of regrind to virgin polymer will increase incrementally.

Mixing of the polymers in pellet or powder form is often performed by a material supplier, which a moulder buys in batches. However, most moulders, Broanmain included, have dosing units on site to create a polymer mix when smaller quantities are required.

It’s important to seek a moulding partner that can think creatively and use their engineering acumen and chemical knowledge to present the best materials for a moulding project. Understanding how the molecular structure of plastics change as they are processed is critical when considering which material to use for your project.
Traditionally, torque wrench calibration machines have generally been intended for specific manufacturers’ products. For laboratories and OEMs this can be a real nuisance, requiring several different machines to cover each torque wrench manufacturer; which can be expensive and takes up a lot of bench space. For this reason, a truly universal calibration machine is a godsend.

Environmental legislation to control emissions and reduce pollution continues to tighten across the globe. To meet these challenges in the automotive sector, manufacturers are turning to battery electric vehicles, hybrids and more efficient internal combustion engines.

A key concern for developers of these technologies is a simple one: vehicle mass. This critical metric can significantly impact emissions, range and performance, and has led to the now well-established trend of vehicle mass reduction known as ‘lightweighting’. In its pursuit, demand has rapidly increased for lighter materials that are suitable for high-volume production.

This growing need for lightweight automotive components, particularly for alternatively fuelled vehicles, is driving innovation in both materials and production technologies. Meanwhile, the importance of establishing an effective supply chain to validate these new technologies is encouraging greater collaboration within the industry. Technology pioneers, materials experts and the academic world are working together to catalyse technology commercialisation and help the adoption of lightweighting innovations.

These trends are encouraging exciting ventures like RACEForm, a 30-month collaborative project started in November 2017. RACEForm aims to validate Impression Technologies’ innovative Hot Form Quench (HFQ) Technology for the mass production of complex aluminium components and structures.

The large programme has been successfully led by Impression Technologies and is backed by multi-million-pound funding from the Advanced Propulsion Centre UK, with a total project value approaching £10 million. To enable the successful scaling of HFQ, RACEForm is relying on a number of complementary collaborators including Gestamp, Innoval Technology, Brunel University London and Imperial College London.

The significant interest in HFQ Technology stems from its ability to enable faster, less expensive production of complex and lightweight aluminium structures. It offers OEMs significant savings in weight, cost and system complexity through its ability to produce deep drawn, high-strength aluminium alloys with low cycle times, no springback and a level of formability that is just not possible with other techniques. It also helps aluminium compete with steel in terms of affordability – historically a sticking point for widespread aluminium use.

The HFQ process begins by heating an aluminium sheet in an oven. The sheet is then transferred to a high-speed press for simultaneous forming and cold die quenching. This allows the aluminium to be stamped while it is
soft and then quenched to ‘trap’ the strengthening capability behaviour of the material. The part is then heat treated to gain high strength.

“RACEForm is enabling us to bring HFQ Technology to high-volume applications,” explains Jonathan Watkins, CEO of Impression Technologies. “It is the world’s leading high-speed process to form deep-drawn and complex shapes from high- and ultra-high-strength aluminium. HFQ is ideally suited to meet the lightweighting needs of manufacturers, enabling them to replace heavy steel or low strength cold-formed aluminium components with a superior alternative.

“To ensure its suitability for automotive applications, the HFQ process has been designed to meet the cycle times required for low-cost, high-volume manufacturing. Perhaps most significantly, HFQ opens the possibility of using highly recycled aluminium grades that cannot be formed cold. In turn, this will have a significant impact on emissions by reducing the need to smelt aluminium.”

Whilst the HFQ Technology has already been successfully demonstrated in various automotive platforms, the RACEForm project is to certify the HFQ part design and manufacturing process in high-volume structural applications. The project has focused on the production of A-pillar components and chassis assemblies for SUVs and electric vehicles to meet specific OEM requirements.

Collaboration has proved to be one of the project’s greatest strengths, with each partner addressing specific challenges. Gestamp, a Tier 1 supplier and key collaborator, is proving out HFQ for high production trials. Its trial at the Gestamp Ludwigsfelde hot stamping line facility in Germany achieved a cycle time of less than five seconds for an A-pillar component and subsequent, larger trials at Palencia in Spain.

Meanwhile, Imperial College London is leading RACEForm’s structural adhesive bonding and pre-treatment test programme, where researchers have completed surface pre-treatment and analysis evaluations. They have been supported by Chemetall and Innoval, who have characterised the microstructure and surfaces of samples. The projects self-pierce riveting test programme is being run by Brunel University, alongside structural simulations and the evaluation and modelling of joining methods.

To prove the technology’s recycling capabilities using lower grade aluminium, RACEForm is being supplied with highly recycled aluminium sheet from Jaguar Land Rover’s REALITY project, another Innovate UK funded programme. A testing phase has been planned to confirm that the HFQ process can maintain excellent formability, even with high levels of impurities and analysis of the resulting parts. Early forming trials have been successful.

“We have already demonstrated significant cycle time improvements, as well as potentially substantial reductions in CO2 emissions due to part integration,” concluded Jonathan Watkins. “We’ve been successful in lowering embedded carbon content and reducing production costs. Through the use of HFQ Technology, automotive manufacturers will be able to affordably enhance the range and overall performance of their future vehicles. Our successful volume trial has demonstrated the feasibility of the process, replacing a three-part cold formed aluminium A-pillar component with a single HFQ part while simultaneously reducing the part’s overall weight.”

RACEFORM – (RAPID ALUMINIUM COST EFFECTIVE FORMING)

The RACEForm 30-month project started in November 2017 and is focused on validating HFQ Technology for the mass production of complex, deep drawn, high strength aluminium structures for body-in-white and chassis applications. It is also helping to establish the technology as the global standard for aluminium lightweighting worldwide.

HFQ Technology, for which Impression Technologies holds the exclusive global rights, offers OEMs significant savings in weight, cost and system complexity through its ability to produce deep drawn high strength aluminium alloys with low cycle times and no springback.

Impression Technologies, a developer of advanced lightweighting technology, has secured funding through the Advanced Propulsion Centre UK Ltd (APC) to further develop and validate its HFQ Technology for use in the global automotive industry. The total project value is £9.5 million, with £4.8 million in funding through the APC, awarded as part of its seventh round of funding.

Impression Technologies is leading the RACEForm Project with a consortium including: Gestamp Washington UK Limited (a wholly owned subsidiary of Gestamp Automoción), Innoval Technology Limited, Imperial College London and Brunel University London.
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The UK is the only G7 country with a robot density below the world’s average, with just 74 units per 10,000 workers. This positions the UK behind 14 other European countries and highlights the challenge that British manufacturing faces to compete with foreign productivity.

A recent report from the Business, Energy and Industrial Strategy Committee (BEIS) highlighted the extent of the challenge, arguing that if the UK does not make a concerted effort to transition to the Fourth Industrial Revolution, it will miss a pivotal opportunity for growth.

Fanuc UK’s managing director, Tom Bouchier, says: “One of the arguments against automation is that it is too expensive, a belief especially pervasive amongst those that need it most – SMEs. But when you consider that we are around 30% less productive per hour than a German manufacturer, then the financial impact of not automating is clearly far greater.

“This misconception is underpinned by a lack of awareness surrounding automation. Features such as the ‘I am not a robot’ button on websites are indicative of the general mistrust of automation, and UK manufacturers need to work to overcome this mindset in order to boost productivity.”

One of the major arguments in favour of automation is the opportunity it represents to upskill and train employees, essentially future-proofing careers and creating more fulfilling jobs. Organisations such as WorldSkills seek to inspire young people looking to enter the industry, by engaging with the workers of tomorrow and providing clear pathways to enter the industry.

Bouchier concludes: “Automation brings a wealth of exciting opportunities for everyone in manufacturing. By being open about the value it provides, British manufacturing can secure its own future, and help British businesses to compete on a world stage.

“Automation should not be viewed with suspicion because it drives productivity and is therefore not a risk to jobs. Failure to automate is a failure to increase productivity, which ultimately poses a much more real threat to UK businesses.”

The good news is that Fanuc UK has recently delivered a model from its strongest ever robot series to neighbouring research and technology organisation, the Manufacturing Technology Centre (MTC), in Coventry.

With a reach of 3.7m and vertical lifting stroke of 6.2m, the six-axis Fanuc M-2000iA/2300 is the ideal solution for handling and palletising extremely heavy parts, such as automotive chassis and foundry workpieces, up to 2.3 tonnes in weight.

It is the first of its kind in the UK, making it the strongest fully-operational industrial robot in the country. The model will play a vital role in the MTC’s ongoing work with the Construction Innovation Hub and will be used as part of research into large volumetric assembly within the construction industry. As well as handling ultra-heavy workpieces, the robot can also be used for conventional crane, hoist and shuttle applications to increase output and eliminate potentially dangerous manual work.
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Hypertension – high blood pressure – is a killer. However, the good news is that it is relatively easily treated if identified early. This is something that is achieved by measuring it in a way with which we are all familiar.

That method is probably older than you think. The first measurement of blood pressure was made in 1896 by squeezing the flesh around an artery. This method remains pretty much the most common way to measure blood pressure 124 years later, something that seems remarkably anachronistic in the digital age.

Of course, there are many ways of tracking changes in blood pressure and a plethora of wearable and non-wearable devices now on the market that do it. These devices are not cuff-less, however. They require the input of cuff-measured blood pressure and then monitor changes over the next few days. Then a new calibration is necessary using a cuff again. That doesn’t help the one billion plus people in the world at risk of dying from hypertension because they do not know they have it – once they have used a cuff to calibrate a device, they will know that they’re ill and don’t need the device. Other wearable devices are simply not medically accurate, which is even worse.

THE CHALLENGE
What is needed, then, is a device that can quickly and accurately measure blood pressure in a home environment; is not cuff-based and does not require calibration from a formal test by a medical professional. Ideally, the device should be small enough and cheap enough to be built into every mobile phone.

The idea we have in mind will be revealed in the February 2020 issue of Eureka! Until then, see what you can come up with. Submit your ideas by leaving a comment on the Coffee Time Challenge section of the Eureka! website or by emailing the editor: paul.fanning@markallengroup.com
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