

OVER A CENTURY OF MANUFACTURING TECHNOLOGY INSIGHT

MACHINERY

Chaotic approach

Efficient tool
regrinding **p19**

Virtual news

Trumpf delivers arms-
length update **p22**

Printed benefits

Milling & press brake
tooling made a different
way **p25**

Five-Axis machining supplement

Case studies &
product update **p33**



RESHORING

AN ANALYSIS OF PAST EFFORTS, THE CURRENT MOOD & ACTIVITY, PLUS WHAT'S NEEDED

NEW

510mm turning length

XYZ CT 65 HD

**SIEMENS
Touchscreen**

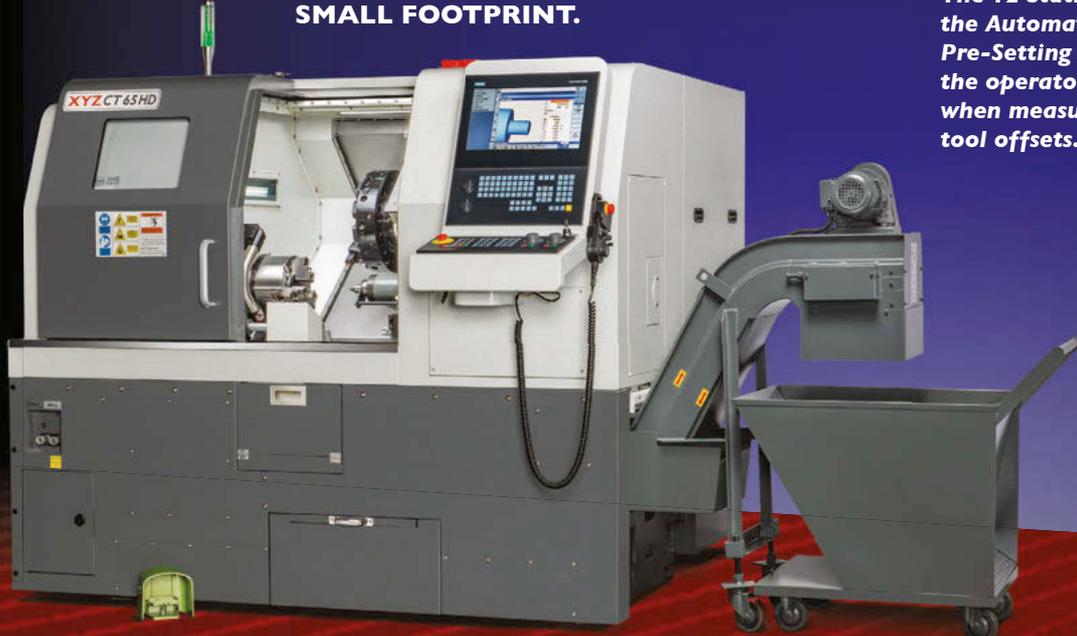
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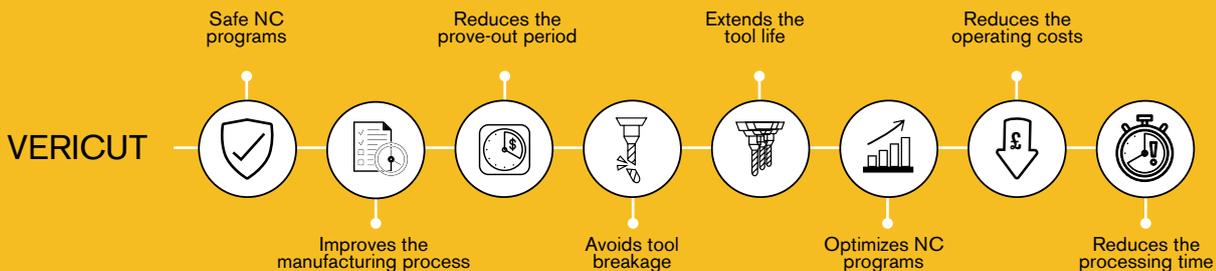
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'Reshoring' is a much-mentioned word in the manufacturing industry, especially amongst engineering component suppliers that took part in *Ventilator Challenge UK*. Andrew Allcock takes a look at the history of such talk and looks at current events. He asks: Is it different this time? The answer is 'yes', but it will still require organisation, direction and support, he suggests

19 Grinding, honing, surface finishing Chaos & order

Cutting tool regrinding that accommodates a chaotic workflow is being supported by ANCA technology in Germany; laser-cut plate surface finishing from by Timesavers' technology wins in the UK

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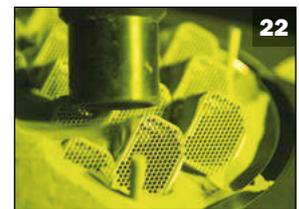
Andrew Allcock 'attended' Trumpf's recent virtual press call, during which the company outlined its response to Covid-19 and also highlighted latest technology developments

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3D-printing is playing its part in helping deliver both high performance metalcutting tools and custom press brake tooling. *Machinery* has the details

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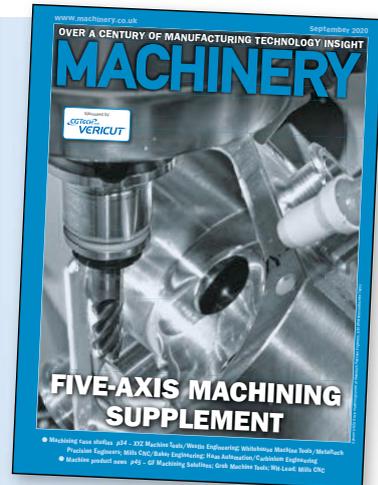
XYZ Machine Tools-equipped toolroom becomes money-spinner for Techgrave; technical trade moulder upgrades in-house toolroom with Hurco machining centre, plus more



Five-axis machining supplement

Case studies: XYZ Machine Tools/Westin Engineering; Whitehouse Machine Tools/Metaltech Precision Engineers; Mills CNC/Baker Engineering; Haas Automation/Carbinium Engineering.

Machine product news: GF Machining Solutions; Grob Machine Tools; WH-Lead; Mills CNC.



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Editor: Andrew Allcock
andrew.allcock@markallengroup.com

Art editor: Neil Young

Sales director: Joe Opitz
joe.opitz@markallengroup.com
M: 07967 169098

Publishing assistant: Lyn Evola
lyn.evola@markallengroup.com

Circulation manager: Chris Jones
circulation@markallengroup.com

Production: Chloe Jeakins
chloe.jeakins@markallengroup.com

Publisher: Jon Benson
jon.benson@markallengroup.com

Annual subscription: £118 (UK) and
£173 (Overseas).



A MARK ALLEN GROUP COMPANY
www.markallengroup.com

Machinery (incorporating
Sheet Metal Industries)

Machinery is published on the first Friday of every month by MA Business, Hawley Mill, Hawley Road, Dartford, Kent DA2 7TJ
T: 01322 221144 F: 01322 221188
E: machinery@markallengroup.com
W: www.machinery.co.uk

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Print – ISSN 1753-0482
Online – ISSN 2049-3312

Printed by: Pensord Press, in the UK



Reshoring 4.0



The response by the UK's manufacturing SMEs and their representative bodies, the High Value Manufacturing Catapult and some of the country's most prominent OEMs to the need for medical ventilators has shown what is possible within these shores. Not just to those who already knew that we have what has become a hidden, below-the-radar engineering capability spread across thousands of SMEs, but government and the general population have seen it, too. Everybody knows what supply chain disruption looks like – no toilet rolls on the shelves at a banal but everyday level, plus the real possibility that getting sick might see this rich country unable to save some of its people. Italy showed us what that looks like.

Buying from abroad proved insufficient to deal with the equipment need, both for ventilators and PPE, as the duff medical devices from China and useless kit from Turkey demonstrated rather well. Lest that seem unduly harsh on those two countries, perhaps this was a problem of unprofessional procurement: we might not have asked the right questions or performed due diligence.

In *Machinery's* May-June issue (p7, www.is.gd/juyome), we covered in detail the bustle of activity that saw the country's manufacturing sector pull together, leaning heavily for our coverage on *LinkedIn*. Often to be seen in the comments associated with the messages were hopes that this effort would open OEMs' eyes and prompt some reshoring. Of course, there are already stories of reshoring; *Machinery* receives and publishes them when they turn up, but we are talking about a much broader, deeper, sustained effort.

This hope of reshoring is not a new one, but after two decades or more of a strategy of outsourcing to low-cost countries, much of it to China, we have arrived at the Covid-19 pandemic and the need for a great national manufacturing effort to compensate for the negative effect of extended supply chains.

We had already seen some global disruption before this, of course, with the great unpronounceable Icelandic volcano ash party of 2010 (*Eyjafjallajökull*, if you want to try). But we have seen it much worse this time. And according to the World Economic Forum (WEF), there are a growing number of epidemic events, amounting to approximately 200 annually. Ironically, in October last year, WEF-driven *Event 201* (www.is.gd/ixoxak) modelled a pandemic. We all now know it is very real and, importantly, the geopolitics of the day are now very different to 20+ years ago, as is the technology available to us to improve our national performance – automation, connectivity, AI, data, Industry 4.0 etc.

So, is it different this time? Yes, but reshoring at large will still require organisation, focus and support to make it significantly real. (Read our feature on p10) ■

www.machinery.co.uk

News round-up

EOS-driven German project aims to deliver next-generation additive manufacturing production line. www.is.gd/tejamo

Labour leader Sir Keir Starmer said the future of advanced manufacturing in the UK hinges on investment in applied research, during a visit to the Welsh government's £20m R&D facility in North Wales run by the University of Sheffield Advanced Manufacturing Research Centre (AMRC). www.is.gd/figoba

Backed by an almost £10m public/private investment, an open access 5G industrial testbed development is to be led by the University of Sheffield Advanced Manufacturing Research Centre (AMRC). www.is.gd/yumetu

The National Physical Laboratory (NPL) has secured £50k early-stage funding to create the Advanced Machinery and Productivity (AMP) Institute in Rochdale. www.is.gd/agaker

Createc is leading a new project with Nuclear AMRC and TSP Engineering to develop a robotic system to inspect the most challenging welds for the next generation of nuclear plants – Advanced Modular Reactor (AMR) projects. www.is.gd/ikuloh

The University of Strathclyde is set to be involved in six of the Scottish government's Advancing Manufacturing Challenge Fund

MACH 2021 (25-28 January) and other shows and exhibitions have been given the official go-ahead in the coming months, adhering to the 'All Secure Standard', which is endorsed by the Department of Culture, Media and Sport. The Manufacturing Technologies Association (MTA), which owns and organises MACH, has been closely involved in the drafting of the guidelines with the Association of Exhibition Organisers. The MTA strongly believes that MACH 2021 will not only be safe for visitors and exhibitors but also provide a great platform for firms to stand out in the market as the economy ramps up. www.is.gd/suwoxe

Lockdown composites machining praise

Composite engineers at the University of Sheffield AMRC made sure critical satellite components helped 'keep UK industry moving' during the Covid-19 pandemic lockdown and have been praised by Airbus Defence and Space bosses for the speed, efficiency and accuracy of their work.

Kevin Clynes, who heads up research and process technology engineering for the Airbus division, said the complex machining operation on the base cone for its new satellite was done "during a very difficult time with speed, efficiency and accuracy" by engineers from the Composite Centre at the University of Sheffield Advanced Manufacturing Research Centre (AMRC).

"Despite the restrictions and challenges of the Covid-19 lockdown, it was crucial to Airbus Defence and Space to continue with operations," he says. "This



The Airbus satellite component within the machine envelope

was not only about keeping our business going but also about keeping our customers, partners and suppliers operating as well.

"When we contacted the AMRC, it was clear they wanted to assist us with this project to keep our business plan on schedule. This was very much appreciated and successfully demonstrated how we could work together, communicating remotely, to

achieve this. The AMRC showed great effort and commitment to keep UK industry going during this challenging time."

This work forms the latter stages of two years of research collaborations between Airbus Defence and Space and the AMRC that initiated the establishment of a method to machine aluminium honeycomb with composite skins, achieving zero defects.

projects. Through the National Manufacturing Institute Scotland (NMIS), the University will lead on two projects and support the development of four others. One project focuses on the key technology area of additive manufacturing, aiming to de-risk innovation by providing companies with the knowledge required to make the correct business, technology and investment decisions. www.is.gd/otofom

The GTMA has undertaken a survey of the UK-based 3D-printing

(3DP)/additive manufacturing (AM) community and reveals that there are over 500 UK-based companies that have the process as a core element of their business operations. www.is.gd/itahiy

Lotus is to establish a new advanced technology centre (right) in Wellesbourne, where Lotus Engineering – the consultancy division of Group Lotus – will also base its HQ. www.is.gd/dihibi



Apprentices and young engineers at the very start of their careers with Siemens Digital Industries in Manchester and Congleton were part of a team of 100 people from Siemens UK, Digital Industries (DI), Industry Software, Siemens

Healthineers and Siemens Energy that enabled the *Ventilator Challenge UK* consortium to achieve its target of assembling 13,500 medical devices in just 12 weeks. www.is.gd/usucoj

BAE Systems has added a fourth Stratasys F900 3D-printer to its

manufacturing site in Samlesbury as it builds its transformative "Factory of the Future". The company says for the manufacture of production tools it is witnessing "significant cost and lead time reductions" against those of traditional manufacturing methods. www.is.gd/peloha

Engineering Technology Group has signed a multi-million-pound contract with the Pexion Group to



consolidate the technology management and advancement of its multiple manufacturing businesses. www.is.gd/axajog

Renishaw is collaborating with UK start-up business Additive Automations as part of a project to automate metal additive manufacturing (AM) post-processing, which involves using collaborative robots (cobots) to perform support structure removal. www.is.gd/icinec

MSC Industrial Supply Co has won a three-year contract with Sulzer as preferred supplier for metalworking and MRO categories. The win covers the global leader in fluid engineering's 25 UK facilities. www.is.gd/befife

Digital manufacturer Protolabs has secured a global accolade for demonstrating excellence in health and safety. The company received a RoSPA Gold Health & Safety Award for ensuring its staff, customers, contractors and any visitors to its manufacturing facility in Shropshire remain safe. www.is.gd/wicapa

Renishaw has launched its own online virtual exhibition. Called 'Virtual-Expo', the rationale behind this new initiative is to bring Renishaw's traditional exhibition offering to customers in an engaging and interactive digital format, accessible 24/7. www.is.gd/miluwo

Carfulan Group has expanded its workforce by almost 20% as it continues to strengthen its offering to UK manufacturers. www.is.gd/icocix

In-Comm Training, which operates three technical academies across the Black Country and Shropshire, has just released **23 new vacancies** for young people and mature workers looking to train in administration, operations or various disciplines of engineering. www.is.gd/osuyiv

A £3m ESF-funded, 18-month programme aimed at providing a strategic approach to developing employer-led skills with businesses across Cornwall and the Isles of Scilly (CIOS) has concluded with exceptional results for the Cornwall Manufacturers Group (CMG). www.is.gd/zagowi

Hurco has set up a manufacturing cell in its High Wycombe technical centre to underline that machine tool tending can be simple and inexpensively automated. www.is.gd/eyuyot



Mike Wilson (above) has been appointed chief automation officer at the Manufacturing Technology Centre (MTC). He will lead the MTC's drive to increase the adoption of automation throughout UK manufacturing. www.is.gd/yixohi

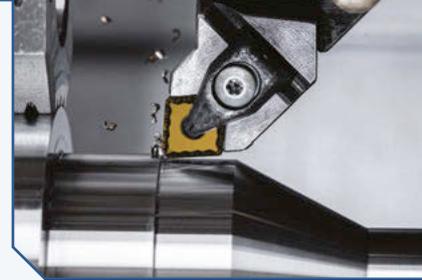
Dr Jennifer Johns has joined the GTMA team, bringing a range of expertise including research on technological change and innovation in global supply chain networks to the organisation. www.is.gd/atogam



Product pick 10

Ceratizit ISO turning inserts offer cost benefits

Ceratizit's new Standard Line range of ISO turning inserts (right) provides customers with significant cost benefits, while retaining the quality and performance expected from the Ceratizit Group. www.is.gd/asiten



Better steel drilling

Kennametal's HPX next-generation high-performance drill is for steel applications and "sets the bar for tool life, productivity". www.is.gd/ecibig

Tornos SwissNano 7

The SwissNano 7 sliding-headstock lathe has proven its worth with many customers and excels in the machining of parts for the medical, dental, electronics and the micro-mechanics industries. www.is.gd/buvava

CNC simulation bar raised with Vericut Version 9.1

Several new cutting-edge features increase efficiency and empower users to do more in less time, says CGTech. New visibility options, plus enhancements to toolpath optimisation, additive manufacturing, tooling and multi-tool stations, measuring and inspection/reporting are highlighted. www.is.gd/evaxuv

Unmanned wire EDM made reality

Two new wire EDM slug-related innovations from GF Machining Solutions make true uninterrupted and unmanned operations a reality. www.is.gd/loqupa

Grob linear pallet storage system

Grob Systems has developed a new linear pallet storage system (PSS-L) - an automated, flexible manufacturing line that complements a wide variety of part types. www.is.gd/cexiwe

Videos explain Baty metrology software update

Bowers Group has created a series of videos covering new functions included in the latest version of Fusion Software from Baty International. www.is.gd/yurepe

Esprit support for Mazak Smooth AI controls

CAD/CAM package Esprit's digital twin may now be used within the Mazak Smooth AI CNC. The extended support offered includes the ability to utilise the Esprit digital twin inside the CNC itself. www.is.gd/sokapa

Mapal composite milling system gets new addition

Mapal's new milling cutter OptiMill-Composite-Speed-Plus is the logical further development of the OptiMill-Composite-Speed in relation to tool life and fracture strength. www.is.gd/yuwado

Social distancing & productivity improvement

Using proven hardware and software, Siemens has developed a solution for workplace social distancing (left). Companies can simulate and manage possible risks to their employees while at the same time increasing productivity. www.is.gd/exoduf



Is the tide turning for reshoring?

'Reshoring' is a much-mentioned word in the manufacturing industry, especially amongst engineering component suppliers that took part in Ventilator Challenge UK. Andrew Allcock takes a look at the history of such talk and considers current events. He asks: Is it different this time? His answer is 'yes', but it will still require organisation, direction and support

For 20+ years, the UK, along with many other industrialised nations, has sought out suppliers far away in an effort to maintain competitiveness. Following the Covid-19 pandemic and a changed geopolitical landscape, the tide seems to be turning, with supply chain resilience now a key concern

Reshoring. A term not much used till this century, really, until the rush to China gathered pace in the first decade of the 2000s. In 2004, Airbus said it planned to further increase its procurement from China, raising it to \$120 million a year by 2010, double the target the company already has for 2007 (*Machinery*: www.is.gd/osoqub). The benefits of overseas procurement were also highlighted. IMI said in 2004 that its 50% increase in product development over the last three years was supported by funds released by offshore manufacturing. However, there wasn't any choice but to join the exodus. Globalisation was no longer an option, but an imperative, said *Boston Consulting Group* the same year. The migration of sourcing, manufacturing, R&D, and service operations from high-cost countries to low-cost countries is well under way and is accelerating, it said. And a new report on the future of the UK aerospace supply chain of that same year said we're increasingly losing out to low-cost countries in the race to supply machined components.

And it wasn't just the large OEMs hot-footing it to the

Middle Kingdom and elsewhere. Suppliers were at it, too (*Machinery*: www.is.gd/yufiye). Stockport-based Mini Gears was an early mover, having set up an operation in Shanghai around 2003 with the aim of sourcing gears in volume. Ely-based Shearline Precision Engineering and Techno Group were others that went looking for partners in China/Asia around the same time.

The direction of travel was clearly all one way at this time. In *Machinery's* centenary issue of 2012, we quoted Chancellor Gordon Brown, who said in 2005: "The global economy is undergoing the most rapid and extensive transformation the world has ever seen – in pace of change, in scale of change, in impact of change." He added that China produces a quarter of the world's washing machines; 30% of its TVs; 50% of its cameras; 70% of all photocopiers; and 90% of its toys.

In 2006, we noted that Chinese manufacturing had grown a staggering 12% every year between 1998 and 2002, and the country's exports from outsourcing were expected to grow 45% over the next five years.

Warnings were being made about this rush, though.

The Institute for Manufacturing said in its 'Making the right things in the right places' report of 2007 (*Machinery*: www.is.gd/ehacef) that "many firms are relying too heavily on short-term outsourcing and offshoring to countries such as India and China".

So, today UK manufacturing is some 10% of GDP, while at the turn of the century it was 20%, although it also drove a further 15% of GDP according to professor Lord Kumar Battacharyya. His sentiment was echoed in a report of 2018 published by the *Manufacturing Technologies Association* (www.is.gd/wuvofe), which said: "The sector is responsible for 23% of UK GDP, well over double the figure that is routinely quoted, and is responsible for five million more jobs than often thought." But it is smaller today, clearly.

To reshoring, though. We tackled the topic in 2013 (*Machinery*: www.is.gd/juside). Talk of reshoring had emerged in 2009, with *Make UK* (then EEF) releasing a survey that showed that about one in seven companies with production in a low labour cost economy had returned some of that activity to the UK in the previous two years. But the proportion of manufacturing companies with some production outside the UK grew from 32 to 42% between 2009 and 2012 – with about a quarter expecting that to increase moderately in the next two years, we wrote. A mixed message, then.

In the same 2013 article, the trend towards product innovation and agile supply, and not merely lowest cost manufacture, was noted by *Associate Parliamentary Manufacturing Group* (APMG) manager Thomas Kohut. APMG was set up to encourage the exchange of knowledge and understanding between Parliament and the manufacturing industries. It had published a report on reshoring (www.is.gd/ejebay) in February 2013. The report's summing up included this: "There is concern, however, that the decline in UK manufacturing over the past two decades has resulted in a perceived drought of adequate supply chains." We will hear that echoed again later in this article.

A government initiative of the day that was helping supply chain companies gear up, drawn along by partnering OEMs, was the *Advanced Manufacturing Supply Chain Initiative* (AMSCI), which had been launched in 2011. The scheme provided subsidies for capital investment, research and development, plus training for industrial projects involving collaborations across supply chains. *The Society of Motor Manufacturers & Traders* (SMMT) was making use of this scheme to build up the automotive supply chain on the back of car OEM investment of the time. (A similar initiative today is the *National Manufacturing Competitive Levels* (NMCL) *Automotive Programme*, while for aerospace firms, there's *SC21/Sharing in Growth*).

As it happens, the automotive industry had been undertaking a proxy reshoring analysis via its local

content studies. First started in 2009, reports in 2011 and 2015 followed. And there appeared to be good news. The 2015 publication noted that the amount of value sourced by UK car manufacturers from UK suppliers had increased by five percentage points, from 36% in 2011 to 41% in 2015. This publication followed a November 2014 *Automotive Council* report (www.is.gd/sejufo) that highlighted £2bn-worth of opportunities for UK suppliers, with this adding to a £3bn figure identified the previous year. And in 2016, the SMMT launched its *Automechanika* exhibition, saying there was a £4bn opportunity on offer for UK suppliers, helpfully listing the components that they might start churning out (www.is.gd/afohun). The opportunity has not been realised in any great part, however.

Government had climbed on board the reshoring train more explicitly in the meantime. In 2014, the Liberal Democrat/Conservative coalition government launched the *Reshore UK* initiative (www.is.gd/ohalip, www.is.gd/dizale) – "a new one-stop-shop service to help companies bring production back to the UK". It was heralded by then Prime Minister David Cameron, but the effort didn't survive too long.

Returning to that *Machinery* 2013 article again, we see the beginnings of what will become today's *Reshoring UK*. Originating trade association *GTMA* was operating its *Manufacturing Resource Centre* (as it still does), talking to OEMs about the possibility of placing work with UK toolmakers and precision machinists, with this further supported by its *Tooling Alliance* – which sees Tier 1 companies approached to let them know *GTMA* has identified a group of UK companies that will work together to take on some of the larger jobs that have previously been offshored.

But perhaps the volume level around reshoring had been turned up at this time because it was now possible to conceive it feasible. Says one precision machinist in the 2013 article: "An overseas price advantage of some 80% a decade ago has been progressively eroded to nearer 30%, but it is the realisation, once again, that the flexibility of local supply, quality issues, lead times, volume demands and much easier face-to-face personal contact is driving the change to return to UK suppliers." The spokesperson didn't know Covid-19 would provide a test, of course, but industry has proved his point.

In 2016, Prime Minister Theresa May announced plans for a new *Industrial Strategy*. In December 2016, *Machinery* published an analysis of *Industrial Strategies* across the years and we said of the latest: "The image is clearly one of a more interventionist approach, often taken as code for government direction,

Main image, left: Container ship traffic is a visual proxy for increased international trade. According to government 'UK Port Freight Traffic 2019' forecasts, while overall port traffic is forecast to remain relatively flat in the short term, it will grow in the long term, with tonnage 39% higher in 2050 compared to 2016. Unitted freight traffic (containers, but excluding cars) is the main driver

Below: Felixstowe is the UK's busiest port, dealing with 48% of the country's container trade. It is Europe's eighth busiest port, handling container traffic of 3.8m TEUs. It is the UK's first purpose-built container handling port, providing a service to the world's largest container ships



harkequin9/stock.adobe.com



Aston Martin Lagonda (AML) is a low-volume car producer that could provide the gateway into automotive supply for UK SMEs, believes James Stephens, the company's director global government & external affairs (inset & p14)

Main picture is AML's just-launched SUV, the DBX, which, it is anticipated, will add a considerable volume uplift to the prestigious marque's output

cash support or even nationalisation.” (*Machinery*: www.is.gd/opofis.)

Now, since then the government has been preoccupied with Brexit and leadership – the latter settled, the former not – so official talk of reshoring diminished. But along the way, Brexit, especially a no-deal one, might be a spur to reshoring, some have suggested. The passing of the deadline to extend the transition period sees no-deal looming and the government is now making related announcements; one of those does have a reshoring flavour – the establishment of 10 freeports. “These zones reduce costs and bureaucracy, encouraging manufacturing businesses to set up or reshore,” said an official announcement on freeports last year (www.is.gd/ekupep). To say this is a new possibility once we are outside the EU is sadly not true, however. There are free ports in the EU and there were free ports in the UK until 2012, when UK legislation establishing them expired, says *Full Fact* (www.is.gd/iyasuk). But it is true that having them will avoid such situations as tariff inversion, where a finished product attracts lower EU tariffs than the raw material to make that finished product, so disincentivising manufacture of the finished article (see Rishi Sunak’s 2016 paper on free ports – www.is.gd/inuwuj – and also later).

The Covid-19 pandemic has clearly demonstrated the weaknesses of distributed supply chains, so the government has initiated ‘Project Defend’. The *Financial Times* reported on this in early June (www.is.gd/cozazo), saying that this is “an internal exercise to ensure Britain retains access to critical goods while diversifying the country’s trading relationships”. And with the *Ventilator*

Challenge UK initiative having drawn so heavily on UK suppliers (see *Machinery*, May/June 2020, p7 www.is.gd/juyome), those involved in that effort have been voicing their hope that this shows the strength of the UK supply base, one that will be positively exploited by OEMs through reshoring.

A strong geo-political element is also in play today, with China no longer being courted but rather now challenged by many countries, most importantly the USA. So, the reshoring volume knob has once again been twiddled clockwise, to use an analogue phrase.

Capitalising on this mood, through the lockdown there have been some online events put on by existing organisations, such as *Reshoring UK* and *IARMA*, to discuss and promote reshoring. Before we get to these, however, a reshoring group of companies has been formed by industry itself, following the collective *Ventilator Challenge UK* effort – *UK Manufacturing Unite* (*Machinery*: www.is.gd/oyikek) is the new grouping’s name.

This initiative broke cover at the beginning of June (www.is.gd/elugum). Launched in response to the national effort to produce more critical medical components and essential equipment at home, it is created and run by manufacturers for manufacturers. The movement is urging more firms to come together to collaborate, share practice and find practical solutions for developing domestic supply chains.

It is driven by PP Automation & Controls, whose sales director, Garry Myatt, is also the new initiative’s collaboration director. In an interview with him on the Hone All blog (www.is.gd/evezuw), he said: “We’ve created a free platform that doesn’t cost you anything to

register and gives you the ability to post your company profile, skills, good news stories and case studies. By sharing and collaborating through social media, together we can reach a much wider audience.

“You can add notices that you can provide help or post requests for when and how you need help. Every two weeks, all requests and offers of support get sent out via e-shot to all registered users.”

At launch in June, orders worth more than £600,000 were being celebrated “just by enabling people to talk to each other through the platform”. And Myatt added: “We’ve successfully retained within the UK massive orders that would have traditionally gone overseas, which helps increase both UK GDP and business growth in Britain.” There were 160+ members as of the end of July.

As it happens, PP Automation & Controls is already a member of the nine-member Manufacturing Assembly Network – MAN Group, a collective that traces its roots back to 2005 and who’s creation was supported by Accelerate funding (*Machinery: www.is.gd/uhuwet*), an automotive initiative of the time. MAN was brought together initially with the aim of producing a large assembly for the automotive sector but has long since broadened its scope. Members offer complementary, rather than competitive, services and the group boasts 2,000 employees across all the companies.

Common to all networks is that they must engage with the large OEMs and, probably more importantly, that large OEMs engage with them. That latter point is underlined by GTMA CEO Julia Moore – GTMA drove the development of *Reshoring UK* (*Machinery: www.is.gd/yuziwu*) and Moore heads up its efforts. What *Ventilator Challenge UK* revealed was a whole world of subcontractors in the UK that OEMs have no direct knowledge of, or contact with, she advises.

“The key thing is to get the primes, OEMs and Tier 1s, involved in this [*Reshoring UK*]. The Covid-19 situation has shown them that they didn’t know where the bottom of their supply chain in the UK is. That really has displayed the frailty of the supply chain. We don’t expect that everything is going to come back [to the UK], we’re not that naive, but we are saying to those manufacturers, do consider dual sourcing. Something like this [Covid-19] is likely going to happen again. They need to, at least start to, put dual sourcing in place. And we’ve heard that companies are talking about that, that they see this as a situation that they can’t be exposed to in the future.” And outside of the immediate issue, she adds that we are continually experiencing global shocks, so dual sourcing has a wider need (interesting to note here is that the world has seen a growing number of epidemic events, amounting to approximately 200 annually).

Reshoring UK is an initiative of some five years’ standing that has been developing an online supplier database over that time. Now, the key point about

Reshoring UK is that it leverages existing trade associations, sector organisations and other groupings, some 26 at the moment. So, it is not recreating another network or group but building upon existing foundations that have existed, in some cases, for many 10s of years.

These existing organisations know their membership base intimately, as Moore points out: “They’ve got the sustainability because they know whether they’ve still got that company in membership. They are responsible for maintaining that data, so the data is up to date.”

Reshoring UK is a neutral platform. Any enquiries linked to suppliers are distributed to the supplier’s trade association – the link is always between the association and its member. A strength of a trade association such as the GTMA is that it is able to create a supply chain or cluster group for an industry need from within its membership. No more so than recently. Says Moore: “Through our Medical Cluster of 100 companies, the GTMA was involved in early March, working with UCL on the CPAP ventilator in which our members were involved, proving SMEs are agile and can transfer their skills from automotive to medical manufacture. We received a letter of thanks from UCL, who we are still working with for the future.”

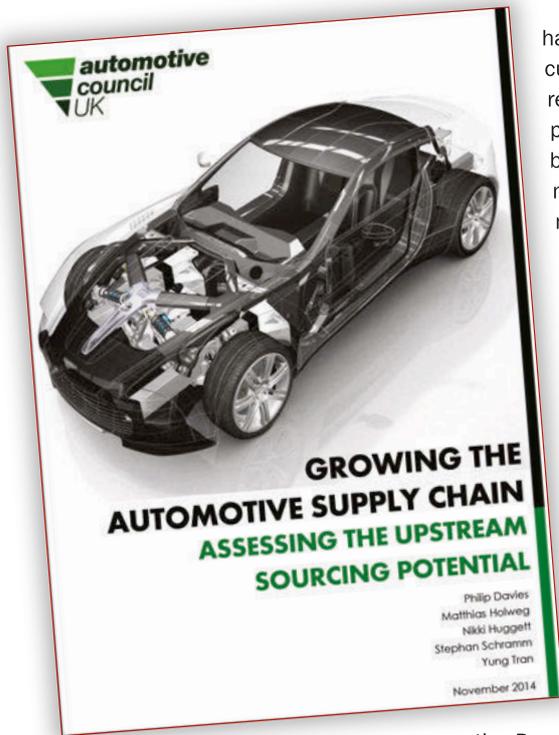
GTMA’s current Cluster Groups of Medical and Rail are likely to be expanded, with the addition of Nuclear and MOD. With small supply chain companies clearly of huge importance to large OEMs, GTMA’s CEO suggests that government consider ‘bottom-up supply chain rather than the top-down OEM’ support.

On *Reshoring UK* matters, she advises that recent joiners are Invest Northern Ireland, there’s a Wales connection too, with Scotland next up for a discussion. Away from the devolved governments, the Rail Industry Association and the Rail Forum Midlands, plus Farnborough Aerospace have or are expected to join, with other similar associations on the list of those to be contacted. Importantly, some of these have the primes and Tier 1s in their membership, which is what *Reshoring UK* needs, admits Moore, to bring the top and bottom of the supply chain together. “It’s no good if we can’t get them [OEMs, primes] to actually use the *Reshoring UK* website and consider improving their supply chains.” But once there, the depth of the UK SME supply chain universe is clearly revealed.

She highlights, incidentally, that some of the recent joiners

The Reshoring UK initiative is a website backed by 26 trade associations and other organisations. Recent joiners have been prompted by current events and more prominent talk of reshoring





Supply chain opportunities within the automotive sector were pointed up years ago but many still remain unclaimed, due to a variety of factors affecting automotive confidence and investment. But with the move to an electrified future, perhaps there are some new ones that the UK can exploit, such as lightweight materials

have been prompted by current events and talk of reshoring; there is greater power and resonance behind the organisation's message that is seeing momentum build and Moore is able to engage with more organisations, now that the GTMA/ Manufacturing Resource Centre has an additional resource in the form of recently joined Alan Arthur, chief technical officer.

The platform's head hints at UK government contact that may lead to support for Reshoring UK's efforts, while engagement has also been made with

the Royal Academy of Engineering

– which has just published a report (www.is.gd/ovomus) on the industrial supply chain response to the Covid-19 pandemic – to further push Reshoring UK's message of its existence and capability. That report makes recommendations at large for the engineering profession to prepare supply chains to weather future disruptions – Reshoring UK is clearly one tool in the box that is ready to play its part.

Julia Moore was also a panellist in the IORMA 'Reshoring – Manufacturing Locally' online event held in July. IORMA is a Foresight Research Organisation concerned with future trends in Global Consumer Commerce and the impacts of evolving disruptive technologies.

Additional panellists included Roger Willison-Gray, corporate relations director, IORMA, who highlighted a rather more banal supply chain problem caused by Covid-19. Apparently, spare parts for domestic heating systems were in short supply – valves and small mechanical components for heating systems were just not available. He is a big Industry 4.0 advocate and suggests the use of technology to compete with the low-cost overseas suppliers that we have relied on. Do more with less; automate. Education and skills training to support that move were highlighted as crucial, however, by Beverly Nielsen, associate professor/director at IDEA Institute, the Institute for Design & Economic Acceleration, Birmingham City University.

Bringing a more high-profile product to the reshoring discussion was James Stephens, director global government & external affairs, Aston Martin Lagonda

(AML), who also chairs an Automotive Council group concerned with regional activity. A small manufacturer of some 5,800 vehicles/annum, AML makes use of both licensed components from other larger auto firms and bespoke ones that have brand value made by smaller suppliers, often in the UK. Noting that a number of parts are no longer made in the UK and will not come back, instead he focused on what's possible and the future. The majority of AML's wheels are manufactured in Europe and Asia, for example, and "it's just too expensive to bring back", he offers, adding: "So we should, in some respects, accept that we've lost that but look to the future, where we have our strengths."

Mike Hawes, CEO of the SMMT, speaking in another recent webinar, backed Stephens, saying that, particularly with respect to the Automotive Council report mentioned previously on the reshoring opportunity: "Those opportunities are still there. We don't make probably 20-30% of the products that go into vehicles – we just don't have that industry.

"Famously, we make very few alloy wheels, yet we make 1.5 million vehicles. There's at least four of them on every vehicle, that's an opportunity. But to attract people here, you know, what we have seen is a consistent erosion of investment in automotive over the last three years. There's a bit of a spike because of one particular Land Rover investment, but that investment has gone down, because people are still sitting on their hands waiting to see whether the OEMs or the major manufacturers are going to be here for the long term [re Brexit and the final deal]." So, for the automotive sector there is still a bigger issue at play.

However, Reshoring UK's Moore, pointed out the flexibility of the country's small SMEs in switching to making new-to-them engineered parts for the medical sector recently. "It is a very difficult message for us as associations to get through, that there is this layer of SMEs with the skills that still exist. And that's what reshoring is showing or is demonstrating, that there are companies that can undertake different processes within varying engineering requirements."

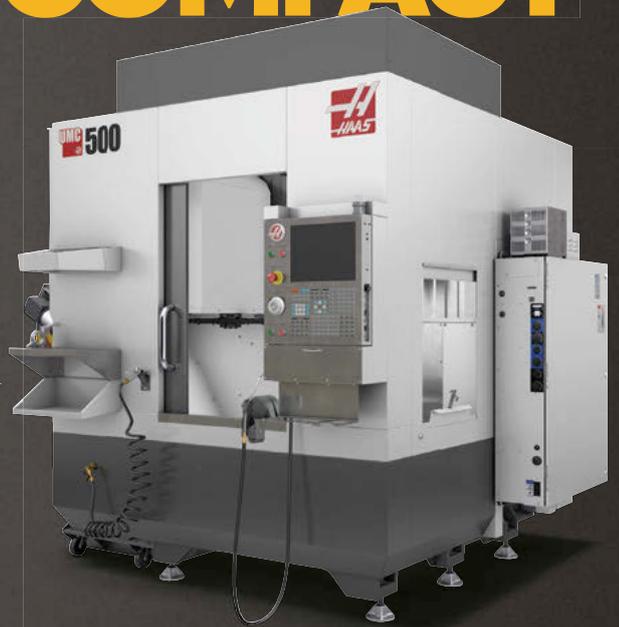
AML's Stephens said the scaling up required for small companies is a barrier. Yet he doesn't rule out the sort of reshored manufacturing that mimics its V12 engine manufacture, which "is made in AML's engine plant in Cologne" and so "there is no reasonable, rational reason why we couldn't look to do that type of manufacturing in the UK in the future. And we continue to continue to look for various opportunities".

The future for the industry is electric, he is clear, though, adding that electric cars will need to be lighter, which is an area where we do have strength. "We have great strength in materials. We have great small businesses up and down the country that are supplying both aerospace and automotive, and they could supply

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Julia Moore, GTMA CEO and lead on growing Reshoring UK membership and engagement. The GTMA's own efforts in reshoring go back several years, with the trade association the main driver behind the creation of Reshoring UK. It is an organisation that, to coin a phrase, is oven-ready to support a broad reshoring effort, building as it does on the strong foundations of many existing associations and organisations

both. What we need to do is invest in that and see these companies scale up and make these components in large volume. At the moment, it's only companies like Aston Martin Lagonda, McLaren and other luxurious or performance businesses that can afford to put those components [made in low volume] into their vehicles."

More generally in the push towards electric, Stephens said: "We need to see support mechanisms for the supply chain, as well as the OEMs. If suppliers aren't there, we can't buy from them. Get them here; either incentivise inward investment, whether it's a big multinational battery manufacturer or a composite manufacturer; or we need a support mechanism in place to see an SME get a step on the ladder that allows them to supply a company like us, and we will be their route to market in small scale. If they can supply us, they can possibly go to JLR or Nissan. As an SME, you can't knock on the door of such an OEM and say 'can I supply you?' The requirements to supply them in scale and quality are pretty aggressive, so we like to see ourselves, plus other small volume manufacturers like McLaren and Lotus, as that doorway into the automotive sector."

But helping small companies is difficult for government, suggests Willison-Gray, who cites East Anglia LEP's recovery plan that failed to touch small companies, focusing instead on the 3% of businesses that account for about 30% of economic activity. He did point up Derbyshire and Nottinghamshire LEP's D2N2 initiative (www.d2n2lep.org) as a good example of SME engagement, however.

AML's Stephens highlighted a weakness of the variation in regional incentives and strategies, however. "If we want a particular supplier to come into the UK, we'll work with our local LEP, of course, but if that supplier is someone we want to scale up but is in another geography in the UK, that geography may not necessarily see us or that company as a strategic part of its economic future and they won't provide the funding. That's why we need some sort of centralised strategic fund like AMSCI." And currently, while there is automotive support from government for transition to electric, this is R&D funding, not supply chain development funding, he added.

Willison-Gray also highlighted another factor at work in the reshoring mix. A recent business project he was involved with concerned an electric bike. Looking through the business plan, he saw that manufacturing would be in Nigeria. "I thought, that's odd, but when I looked into it, it's because of the trade tariffs on batteries from

China. They can actually manufacture these things 30% cheaper in Lagos, but their market's in the UK." Perhaps the proposed free ports might make a difference in such cases.

So, what do we have? Is talk of reshoring different this time? Yes. The SME component supply sector has demonstrated its capability; OEMs, government and the public have clearly seen that – there can't be many that don't have awareness of the impact of distributed supply chains. There is a belief within SME manufacturing that reshoring might actually be possible and from that self-belief has sprung a new industry-initiated group that is already scoring success, while we already have an established initiative that has built connections, relationships and credibility, and continues to strive for greater success, building on existing industry groupings. That we have missing parts of the supply chain might not be such a massive issue,

because we can bring existing engineering capability to bear on different products, as *Ventilator Challenge UK* showed. The issue of scaling up small suppliers is clearly identified as an issue, but we have national models in *AMSCI*, the *NMCL Automotive Programme* and *SC21* that have proved their worth. On the other hand, regional support, while helpful, could mean too many varying and competing priorities when a national view is required. Finally, geopolitics has changed. Obviously, we have Brexit, which is still under construction, and will affect the country and manufacturing, but that is a whole other article. We arrive, then, at a need for a national strategy containing some explicit aims, because the current reshoring momentum, however good it looks right now, requires collective focus and support.

Final word goes to AML's Stephens on some of what is needed: "We need to factor in the Strengths, Weakness, Opportunities and Threats, a proper SWOT analysis, of what we can do as an industry and country. And in that we'll look at supply chains, technology, the business environment. We need low taxes, we need investment support funding, we need to make sure that we've identified those key supply chain opportunities and the key areas that we can develop in the next-generation technologies."

And specifically on UK-made parts, he concludes: "If the automotive industry is strategic, we need to make sure we can take those suppliers on that journey at the same time, otherwise, if we have a car industry here, they'll be buying componentry from elsewhere, which is a missed opportunity for the UK." ■



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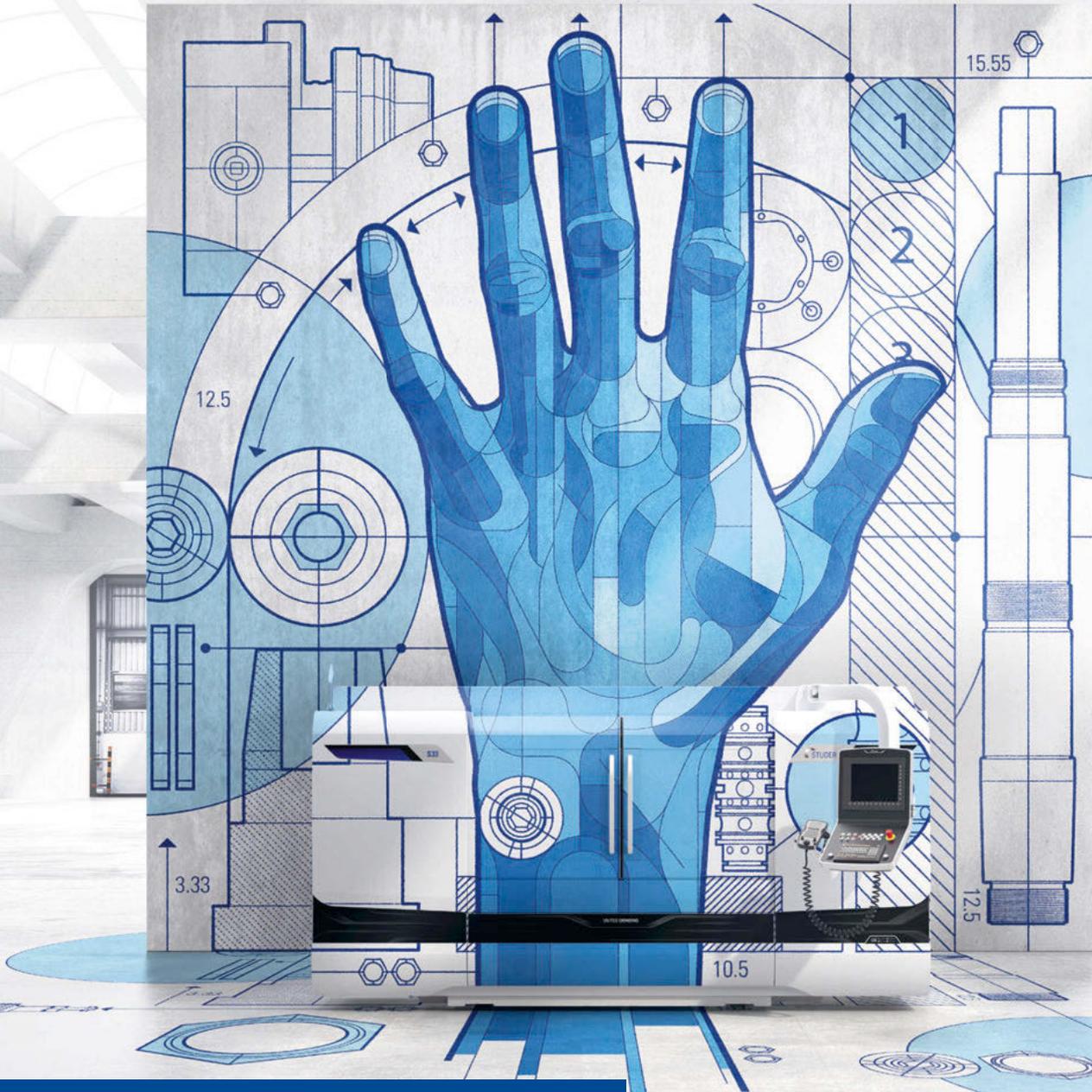
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Timesavers technology is providing a professional finish on sheet metal parts at Alphin Pans

Thursday to prepare tools for automated regrinding on the unstaffed weekend. The tool pallets are loaded to suit the optimal production processes; using chaotic loading increases productivity and minimises cycle times.

SHEET METAL FINISHING

Moving to something rather different, surface finishing of pizza pans, and Alphin Pans has recently installed two Ellesco-supplied Timesavers surface finishing machines.

Having started as an importer in 1989, it moved into manufacturing, installing its first metal spinning lathe in 2009. Alphin Pans' managing director, Matthew Sykes, explains: "Having made an initial investment in 2009, we took the decision to relocate and invest further in 2011, which brought pressing and flat-bed laser capability in house. Initially, this capability was for our own pizza pan production, but over time we recognised the potential to offer this to others as a subcontract service."

The business is now split 70/30 in favour of subcontract metal spinning, pressing, profiling and forming. This has also seen Alphin Pans build an international customer base with its products exported far and wide, from Iceland down to the Middle East, which has just resulted in it being awarded the 2020 Queens Award for

Enterprise and International Trade. As a result, further investment was made, including the arrival of a deburring and surface finishing capability in the form of two Timesavers machines from Ellesco (www.is.gd/inulul).

The Timesavers machines are a 42-1350Rb and a 22-900-W, the former initially purchased to meet the requirements of one particular customer, who Alphin Pans managed production spikes for on some 0.9 mm thick laser-cut stainless steel parts. While the laser produced a perfect edge, for health and safety reasons that edge required some finishing. Exchanging ideas with the customer, who already used Timesavers units, the decision was taken to purchase the 42-1350Rb machine with its

rotating brushes that provided the exact edge preparation that was required.

"The Timesavers 42 series machine is a fantastic piece of kit that we use purely for edge finishing and we have run hundreds of thousands of parts through it without any problems," says Sykes.

The second Timesavers machine was introduced to eliminate the need for hand-grinding of 5 mm thick aluminium parts, with the machine being purchased after seeing just six sample parts being processed.

"The impact the 22 Series machine has had is significant, as we have saved hundreds of hours since its introduction. With hand-grinding, these parts would take at least five minutes, where with the Timesavers 22 series and its 900 mm wide abrasive belt these same parts are processed in seconds to a consistent standard. The ease of use of the machines is also a positive, as they can be operated by anyone in the company with minimal training, allowing skilled staff to be deployed on higher value work," he adds.

"From both machines, the added value that we now present to the customer is a positive and they were also impressed by our pro-active approach to meeting their requirements. The result is that we have gained more work, with indications that volume work is also being on-shored back to us, thanks to our willingness to invest and react positively to challenges." ■



Product news

- NUM has added non-circular grinding functionality to its NUMgrind cylindrical grinding software, which forms an application-specific element of the company's Flexium+ CNC platform. www.is.gd/yevuwu
- New cleaning and laser marking facilities on Walter's Helicheck Plus and Helicheck Pro measuring machines' robot loader system make tool inspection and manufacture more efficient. www.is.gd/fatucm
- A new universal cylindrical grinding machine from Swiss specialist Kellenberger & Co majors on providing excellent value at the entry level. www.is.gd/ojihib
- The two-machine X-Series of 2- and 3-axis surface grinders from Taiwan-based Perfect now benefit from full CNC, in the form of the Siemens 828D control. www.is.gd/ijiram

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The Trulaser Tube 3000 suits both new and existing users

Virtual metalworking news

Andrew Allcock ‘attended’ Trumpf’s recent virtual press call, during which the company outlined its response to Covid-19 and also highlighted latest technology developments

Trumpf’s regular Intec exhibition event held in Germany was held as a virtual event for the first time. It drew around 1,600 ‘visitors’ from 56 countries. Trumpf UK’s follow-on Open House has been postponed, so the Intec news for the UK came via a virtual briefing this year on 15 June.

Trumpf’s financial year ends on 30 June, so managing director for the UK operation, Lee Moakes, gave an update on business activity, noting that last year ended on a high, with revenues 29% above the previous year at £60 million. Moving into this year, the company had a strong order book, but the financial plan was adjusted to a moderate £61 million, for which the company was on track, until March. “In the final month of our financial year, we are

unlikely to complete our remaining deliveries fully. To date, we still have around 10% of our customers closed, and 1/3 working reduced time. In reality we expect to end the year 15 % below the plan,” he revealed (see box item for details of the Covid-19 impact on Trumpf UK – www.is.gd/tuxuwa).

Two new products were unveiled – the TruPrint 2000 additive manufacturing unit and the Trulaser Tube 3000 fibre. The first is aimed at the medical industry. With its focal diameter to 55 micrometers, it delivers smoother surfaces, enhanced quality and intricate grid structures. Also boosting quality, inert gas now flows through it back to front, while printing powder is now processed in an inert gas environment, which prevents contaminants from infiltrating the powder circuit. Automated powder bed

and melt pool quality monitoring see operators notified of any error, while end-to-end documentation corroborates the quality of the printing process. Trumpf has already used the new machine to print spinal interbody cages, placeholders between two vertebrae to restore the vertebral segment’s natural height, adding stability. Healthy bone tissue adheres well to these structures. It takes just 24 hours to produce 19 such spinal implants.

Productivity is enhanced via two 300 W lasers working in tandem and which illuminate the 3D-printer’s entire build chamber, while on ease of use, operators can now remove excess powder from the component within the system, rather than having to remove it and unpack at a separate station.

The Trulaser Tube 3000 fiber is a “cost-effective choice even at low to medium capacity utilisation” and is “equally suitable for companies that are entering this technology as it is for companies seeking to expand their production capacity”. The 2 kW machine replaces conventional tube processing steps, such as sawing, drilling and milling, and can cut tubes of 152 mm diameter and profiles having an outer circumference of up to 170 mm, but it can process profiles, round tubes, flat steel bars and, optionally, L and U profiles, cutting mild steel, stainless steel, aluminium, and non-ferrous metals such as copper and brass.

An integrated materials store known as the “bundle space” provides a buffer store that can hold up to 4 tonnes of raw material, or up to 5 tonnes with the machine version

Built-in powder removal is just one of the novelties that the TruPrint 2000 additive manufacturing unit boasts

designed for an 8 m loading length. The LoadMaster Tube system separates and measures the tubes parallel to production and transfers them to the machine. To ensure top-quality parts, step rollers support the tubes and guide them to the machining station. These rollers can be adjusted to the

current tube diameter in one simple action. The machine also features guide rollers on the unloading side which provide more support to long tubes during processing. The TruLaser Tube 3000 fiber ejects finished parts onto a rack. Set to the correct ergonomic height, this allows the operator to

remove them comfortably while the machine continues working. Shorter parts can be ejected straight into a box. The TruLaser Tube 3000 fiber automatically separates cutting slugs and scrap metal from the finished parts and disposes of them in containers. ■

Trumpf's Covid-19 response to the end of June & looking ahead

During the June press event, Trumpf UK managing director Lee Moakes explained the company's actions, which were initiated before pandemic status was reached, in fact. "In mid-February we launched our internal Business Resilience Plan and defined core members, holding bi-weekly meetings but moving to almost daily at the end of the month. Planning for a worst-case scenario and highlighting our critical needs were undertaken, although the worst case at that point in time seemed very unlikely, melodramatic and a major distraction from our business focus. In retrospect, it was time well spent, enabling us to follow the plan to the letter, while we saw each trigger point being actioned earlier and earlier. The safety of internal and external employees was critical, so we had defined external visitor's health assessments to attend demonstrations, while service visits required the completion of Covid-free customer declarations.

"By the end of week one in March, we had 50% of our internal employees working remotely, with the office calls routed to homeworkers, with great success. The Business Resilience team had actioned the PPE orders in the first meeting, so while already becoming in short supply around the globe, we had enough face masks and hand sanitisers to provide to service personnel working in the field, enough to see us through the period without the ability to restock.

"Weekly updates were provided through our Bluenet, internal communication page and we saw it necessary for a bi-monthly 'state of the nation' address to come from myself to avoid misinformation, as can happen in any fast-moving crisis, especially where health and safety are concerned.

"By the third week of March, in advance of the lockdown, we had switched fully to homeworking for all employees and closed our showroom. Throughout the crisis, we have maintained full support for our customers, while at this time we could see so many businesses unsure in how to operate safely and closing. The decline in demand occurred a week in advance of the official lockdown, our samples showed at the end of March that 80% of customers were closed.

"In June, we still operated remotely and have seen our customers return to business, albeit more slowly than we had planned during February and, as we see today, in comparison to many of our European neighbours."

Remote support is, of course, available to Trumpf users via the *MyTrumpf* portal. Unsurprisingly, increased usage has been noted during the pandemic, with that prompted by Social Media messaging. *MyTrumpf* registrations were up more than 50%

versus 2019, while E Shop usage was up 22%, the company reports, with punching tool orders for medical use expedited. The Service App saw 265 more cases logged in Q1 2020 versus 2019. The latest app addition, Easy Order, allows users to identify parts via smart buttons or QR codes, but will in future recognise them via smartphone cameras.

Moakes continued: "I think it's clear that so many industries have been hit hard and we as Trumpf must stand by our customers and support them in every way that we can while everyone takes stock and recovers." The company has had to rapidly adjust to the changes that have been imposed, he added, observing that sales activity has changed from direct visits to increased communication digitally. "We have run many demonstrations of our showroom and held business conferences through digital media. We see that this will be the way forward in the future, as the convenience and time saved by reducing travel to our showroom will gain traction. Therefore, we have invested in remote £4K High definition video equipment for Virtual machine and software demonstrations with the ability to seamlessly transfer to reference customer sites."

But he stressed that one of the company's greatest assets is its Luton showroom, so "we have completed the Risk Assessment and requirement to enable customers to visit the showroom in person again. I can declare that we are open for business in the traditional or the new normal way."

Trumpf technology was involved in the Covid-19 response, in the UK and elsewhere:

- In the UK, WEC Group, who in the last year added three additional TruLaser 5 Series 10 KW units to its capacity, won a contract with *Ventilator Challenge UK* consortium. The company processed 8,000 sheet metal parts with its Trumpf laser and press brake equipment. In addition, in providing hand sanitiser to its own employees, an in-house developed product has gone on to be marketed generally.
- Also in the UK, Newfield this year invested heavily in automation, installing a TruBend Cell 5000 plus a TruLaser 5000 and TruStore. The company has existing Trumpf equipment, too. During the peak of the crisis, the company was able to produce 3,000 bed frames while operating under social distancing conditions, realising major productivity increases.
- Trumpf US employed its showroom to manufacture visors, using TruMicro and TruLaser Cell 7040. Over 2,000 were produced and despatched.

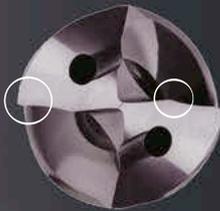
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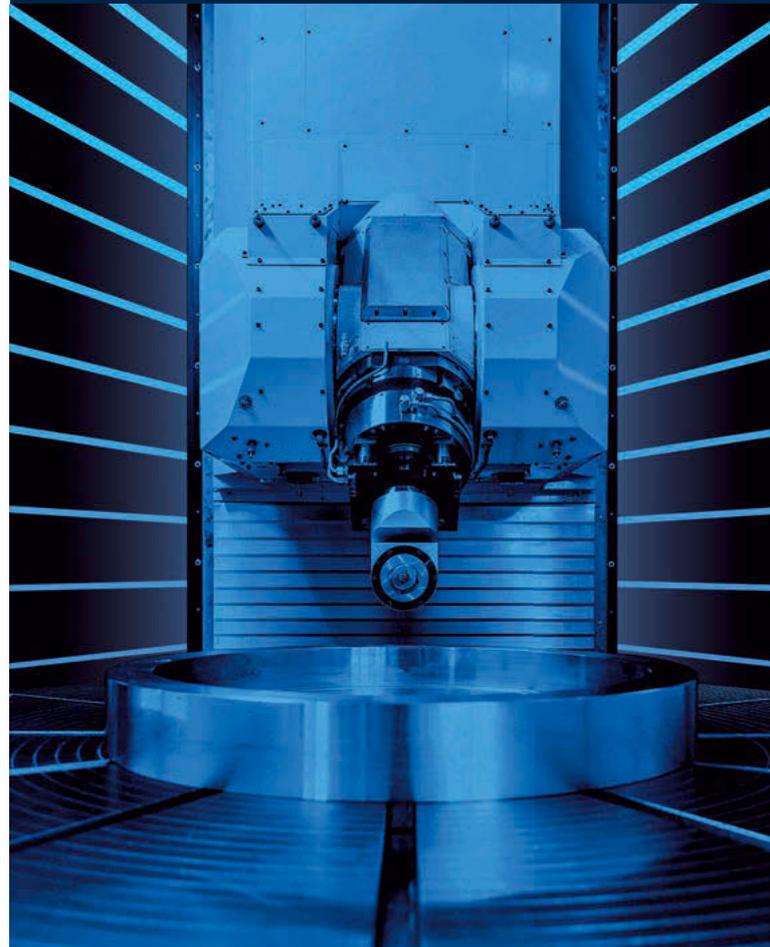
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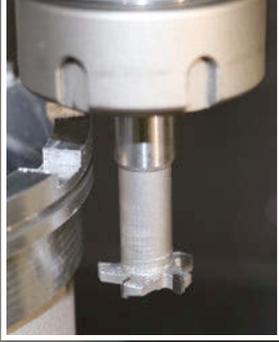
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Guhring 3D-printed PCD tooling has slashed tooling costs and boosted productivity at XCEL Aerospace for this component. Inset: close-up of cutter & part

Fine prints

3D-printing is playing its part in helping deliver both high performance metalcutting tools and custom press brake tooling. Machinery has the details

XCEL Aerospace is a subcontract manufacturer working closely with companies like Rolls-Royce, Collins Aerospace, Safran, Bombardier, ITP Aero, Marshall and Incora. Offering services from CNC machining, fabrication, assembly, additive manufacturing, kitting and even its own range of braided leads, the Essex-located manufacturer is an integral part of the supply chain for many aerospace OEMs.

The Romford-headquartered firm invests heavily in latest technology and innovation to ensure cost-effective manufacturing of high quality precision components. As part of this drive to ensure cost-effective manufacturing, the ADS, BSI, WEAFA and SiG member invited Birmingham-based tool manufacturer Guhring (www.is.gd/ujigoh) to review the machining process for an aerospace valve component. The problem for XCEL was excessive cost when using existing Woodruff-type cutters to machine a cast aluminium component having 9% silicon content.

The previous solid carbide Woodruff cutter consisted of three teeth on a 21.7 mm diameter tool, which was both expensive and delivered relatively poor tool life. Only capable of cutting 10 components before tool replacement, the abrasive high silicone content aluminium was creating productivity,

cost and surface finish issues for the aerospace expert. With two batch types, the Essex manufacturer is machining over 100 parts per month of this long-term project – a figure high enough to cause concern over tool life and productivity.

Invited to investigate the situation by XCEL's engineering and machine shop manager, Alan French, Guhring's regional sales manager, Dewar McKinlay, offered an innovative solution. Says McKinlay: "We explained to XCEL that Guhring has a new method of manufacturing PCD tools by printing them on a MarkForged Metal X 3D-printing machine.

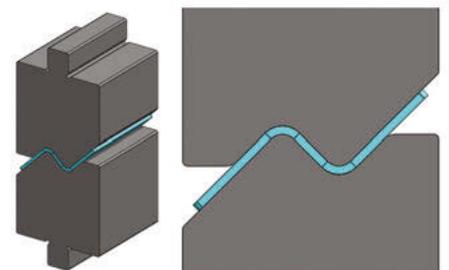
"We made the point that the benefits were the rapid production time in manufacturing these tools. Additionally, this method gives us the design flexibility to produce any tool design we desire. Firstly, we printed a plastic tool to demonstrate the 3D-printing concept tool to the customer. We then made a three-flute tool that was similar to the current tool but with brazed PCD tips. Despite the PCD tips lasting considerably longer on the abrasive high silicone aluminium than the previous tool, we wanted to go further."

The design flexibility Guhring now has with its 3D-printing facility supplied by Mark3D UK (www.is.gd/yinusu) enabled the company's

engineers to internally develop an enhanced design within a matter of weeks. The new design increased the number of cutting edges from three to five, allowing XCEL to increase the feed rate and significantly reduce production times, while at the same time extending tool life.

Manufactured from H13 tool steel, the tool body of the 3D-printed Woodruff cutter has a 13 mm diameter shank with a 70 mm overall length and the identical 21.7 mm diameter at the cutting edge. Performance, cost and productivity improvements have been delivered, as Guhring's McKinlay explains: "This aerospace part is a long-running project for XCEL and we have increased tool life beyond comprehension. The previous solid carbide tool was worn and required a changeover after 10 parts; we have machined more than 180 parts with our new 3D-printed PCD Woodruff cutter and it is still performing well. This is giving the customer a significant tool cost saving whilst reducing the down-time and inconvenience of changeovers."

Stratasys suggests 3D-printed plastic press brake tooling has a place, p26



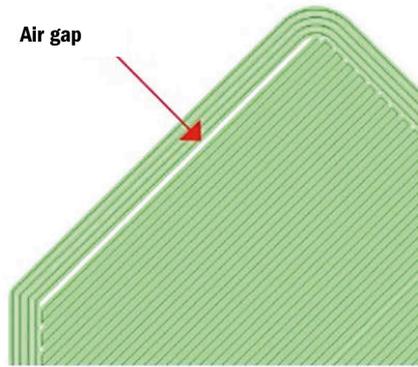
From a design perspective, additive manufacturing is extending the realms of what is possible. As McKinlay states: "Putting five cutting edges on a 21.7 mm diameter Woodruff tool with a solid carbide body would create significant manufacturing challenges. The main benefits of printed tools are we can produce multiple designs very quickly, in this instance evolving from a three-flute to a five-flute tool in a matter of weeks.

"The cost-saving comes from the reduced production time to make the printed tools compared to solid body tools, something we can pass on to the customer. Another benefit with the printed tool is it can be re-tipped. This reduces the cost of the tool further, as the body can be re-used sometimes, whereas the solid carbide tool is disposed of."

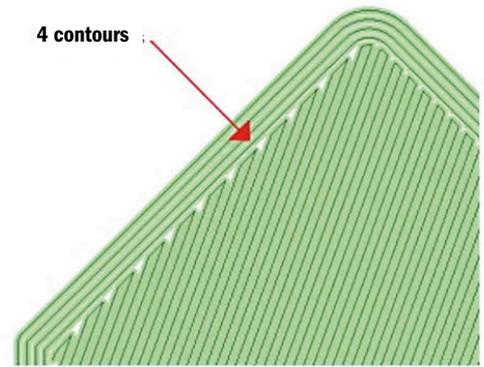
3D-PRINTED PRESS BRAKE TOOLING

Away from metalcutting, press brake tooling can also be 3D-printed, most suitably when complex, non-standard tooling is required. Stratasys (Laser Lines, www.is.gd/elobap) details its findings in this area in a white paper (Additive Manufacturing for Custom Metal Form Tooling). These are plastic tools but are said by Stratasys to be good for volumes up to 1,000 parts.

Traditional press brake tooling is



45° Raster Angle



70° Raster Angle

The printing raster pattern should not run parallel to the contoured outer surface

machined from common tool steels such as A2, D2 or 4140 and is purchased in standard geometries 'off the shelf' from several manufacturers, such as Wilson, Wila and Mate. But when a custom tool is needed, cost and lead time increase drastically.

Any FDM (Fused Deposition Modelling) material can be used for metalforming applications but Stratasys recommends FDM Nylon 12CF, polycarbonate (PC), ULTEM 1010 resin or ULTEM 9085 resin, as they all offer high compression strength.

Tooling considered appropriate for 3D-printing is that employed to produce offset bends, which are primarily used to create additional stiffness in a part or create an offset to allow for a lap joint to mate two parts; ribs, used to add stiffness, with common shapes being V, hat and round; plus dimples/flares, used in the aerospace and automotive industries to restore rigidity

around a weight-reducing cut-out area.

Offset tooling is the main example detailed. The radii of the two bends are recommended to be twice that of material thickness to reduce excess tool wear. A raster pattern infill with four contour passes around that to produce a smooth surface was employed. And the direction of raster pattern paths should not be parallel but at an angle to the contour paths, so as to reduce air gap between the contour paths and infill.

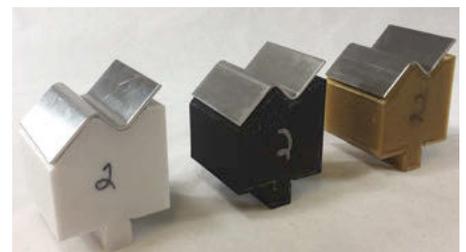
Results when bending 16 gauge (1.62 mm) 5052 aluminium sheet on a 60 ton press, showed both angle and offset indicating little variation up to 100 units across three sets of tooling, one each from ULTEM 1010 resin, Nylon12 CF and PC.

A second test was undertaken for 16 gauge cold-rolled steel using a Nylon 12CF tool. The tool was cycled 250 times at a forming pressure of 90 kN. Again, the tool did not see significant wear, bar the radius, which flattened a little. The tool radius figure at outset was 3.2 mm and became 3.6 mm, but dimensionally accurate formed parts were still produced, Stratasys confirms.

The per-length rating of the tools is around 0.8-1.2 kN/mm (2-3 tons/inch) for maximum loading conditions and this general rule of thumb can be used for similar style tools printed with PC, FDM Nylon 12CF or ULTEM 1010 resin.

Maximum sheet thicknesses are put at up to 2 mm for steel and stainless steel, and up to 3 mm for aluminium. ■

Three different 3D-printing materials deliver similar results



Industry & product news in brief

- BIG Kaiser's new EWA fully automatic fine boring tool has won the 'production performance' category in the French Global Industry Awards 2020 organised to run alongside Paris event 'Global Industry exhibition'. www.is.gd/olujux
- Dormer Pramet is set to acquire India-based Miranda Tools, a manufacturer of high-speed steel (HSS) and solid carbide cutting tools, subject to conditions. www.is.gd/umoduk
- The Komet KUB Centron drilling tool, previously only available to order as semi-standard tools, is now available ex-stock across the range. www.is.gd/oqumod
- Cutting tool expert Sandvik Coromant has launched a new online application training offer to share knowledge and best practices for metalcutting operations. The eight-part programme has been released online and is accessible via the Sandvik Coromant website. www.is.gd/junuzu
- Kennametal's HPX next-generation high-performance drill is for steel applications and "sets the bar for tool life and productivity", the company claims. www.is.gd/ecibig
- Kyocera has added the KPK parting-off series and the MFWN Mini series milling cutters to its line of products. www.is.gd/rocuco
- Quickgrind's Mirage Super range of solid carbide end-mills is designed for a multitude of applications in a wide range of materials. www.is.gd/exulot
- Mapal's OptiMill-3D series is a new programme of solid carbide milling cutters specially developed for the tool and mouldmaking industry. www.is.gd/ogovuw
- Swiss tool manufacturer Mikron Tool (Floyd Automatic Tooling) has added a version of its plunge-mill CrazyMill Cool P&S, making it suitable for even deeper machining operations. www.is.gd/eduyiy



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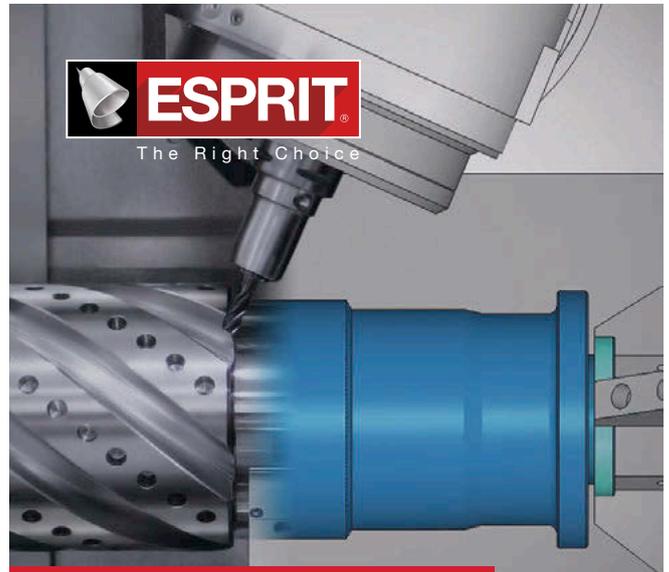
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XYZ Machine Tools has equipped Techgrave's toolroom with multiple machines



Toolroom investments

XYZ Machine Tools-equipped toolroom becomes money-spinner for Techgrave; technical trade moulder upgrades in-house toolroom with Hurco machining centre, plus more

Only founded in 2016, Techgrave has carved out a market-leading position, thanks to its combination of machine tool technology and the decades of experience held by its founders, Pete Adams and Dillon Evitts, plus their dedicated team.

Techgrave provides bespoke industrial engraving and toolmaking to a diverse range of customers, but with particular focus on the manufacture of dies and punches for the production of collectable coins for mints around the world and military medals, both new and reworking existing dies for long-established awards such as the OBE. The jewellery sector is also a prominent user of Techgrave's services. The company has invested heavily in CNC engraving, laser, reverse engineering, CAD/CAM and, most recently, its toolroom capabilities.

This latest investment saw the arrival of an XYZ MiniMill 560 HD vertical machining centre, an XYZ SLX355 ProTurn lathe, an XYZ KMX 1500 turret mill and an XYZ surface grinder from XYZ Machine Tools (www.is.gd/oxorop). This combination of machines provides a complete toolroom solution for Techgrave, as well as greater control over quality and delivery.

Says Dillon Evitts: "When we first started, our initial investment went solely on engraving equipment and software, with any

toolroom requirement being subcontracted. As we got busier, we started to find delays and quality issues with outsourcing, so took the decision to bring toolmaking in house. The XYZ machines give us total control over manufacture of die and press tool blanks, collars and die holders, and the knowledge that we can guarantee 100% conformity across our entire manufacturing process."

Although intended to support Techgrave's in-house machining requirement, the machines soon turned into a business opportunity. "When we budgeted for the machines, we were happy that producing our

own work would cover their costs, so had no desire to fill any spare capacity. We were just happy that we had the capability to meet the demands of our customers. One day we might be making a die for a coin, the next might be a mould for a running shoe, it's that varied. However, as word got out that we had this capability, we began to receive inquiries from existing customers for toolroom work," explains Adams. "We look on this work as a bonus but remain adamant that it will not impact on our own production, whether that is work for established customers in the minting sector

Guaranteed tolerances

Protolabs (www.is.gd/alajeb) is now offering customers a machining tolerance of ± 0.08 mm with a resin tolerance of between 0.002 mm/mm and 0.010 mm/mm, depending on the material. David Barnes, EMEA product manager for injection moulding, comments: "For some applications, such as interference parts, dimensional tolerance is extremely important. Our aim has always been to make the design engineer's job simpler by providing the right amount of verifiable information.

"This means we can now guarantee the tolerances for all of our 50 stocked resins, and we can advise on the accuracy of the other 1,500 that are available to our customers across the world. For the stocked resins, the tolerance will be shown when customers upload their design and select their chosen material as part of our Protoquote system.

"It means that this information becomes part of the design for manufacturability analysis that is typically available within just a couple of hours."



Broanmain Plastics' Hurco VM10i vertical machining centre is now part of its in-house toolroom facility

or one-off commissions for jewellery and even vintage cars and motorcycles.”

This additional work has come about due to the relationship between Techgrave and XYZ Machine Tools, with the Birmingham-based company happy for potential XYZ customers to visit and see the machines in action. This potentially leads to new work, which may only be short-term while a customer places an order for a new XYZ machine. That situation suits Techgrave's founders down to the ground. “Our philosophy with toolroom work that we take in for customers is that it may be a one-off or irregular work, but we are building relationships, this has proved a route to growth as customers respond positively to our service and attitude,” Adams says.

Tackling a wide variety of work, not only for its own production but subcontract machining customers, is a key issue. It is the versatility of the XYZ machines that is highlighted, particularly the control systems.

The ease of use of the ProtoTRAK and Siemens controls makes them ideal for the quick turnround of one-off and low-volume production, with all programs for the lathe quickly and easily created at the ProtoTRAK control, while a combination of at-machine programming and offline programming is used for the Siemens-controlled MiniMill 560. Says Evitts: “It is here that the XYZ machines come into their own, as we don't know what is coming in from day to day.”

At a technical trade moulder, investment in machining technology is allowing the company to bring further control to its projects. Broanmain Plastics has installed a Hurco VM10i vertical machining centre (660 by 406 by 508 mm; X, Y, Z) with 10,00 rpm spindle plus Renishaw (www.is.gd/xaquje) TS27R tool setting and OMP400 part probe.

With this latest purchase, and combined with a recently installed Eurospark (www.is.gd/ulokaw) EDM spark eroder, the Broanmain tool shop now has a full arsenal

of equipment at its fingertips to undertake complex projects, test customers' prototypes and take on repeat technical mouldings.

Justification for the Hurco VM10i (www.is.gd/ahujuy) came after Broanmain won a contract to supply a local OEM of high-end spectroscopy tools. In fact the same client recently named Broanmain as its Supplier of the Year, as a result of the moulder's flexible approach.

Rather than outsource the CNC milling process, which is commonplace, Broanmain now manages every aspect of production. Operations director Jo Davis explains: “It means that one team is accountable for an entire project, from moulding right through to rapid prototyping and milling precise elements into a part.

“Not only is this in-house approach more customer-centric, from a quality control perspective it's easier to manage and more responsive. It gives us the flexibility to undertake a wider variety of projects. Plus, the company can handle materials ranging from polymer to copper, aluminium and other metals, meaning we can now repair and even prototype mould tools in house.”

It was tool shop apprentice and CNC machinist Kamil Stec who campaigned for the CNC mill, researching and gathering evidence for a business proposal. Although the company had a manual mill, which it continues to use for quick projects like drilling and facing, the benefits of automating the process were clearly evident.

Says Stec: “In addition to cost savings, the mill is especially adept at making complex cuts into smaller components, such as copper electrodes.” The spark eroder complements milling, undertaking tasks for which milling is not suited. ■

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service (www.igus.co.uk/iglidur-designer), select the material and request a quotation. Specifications on the material properties, as well as the precision, flexural strength and the price help with the choice. The injection-moulded special solutions are delivered after 10 working days.



Igus – Customers can upload part designs for 3D-printing of mould tools that produce injection-moulded parts



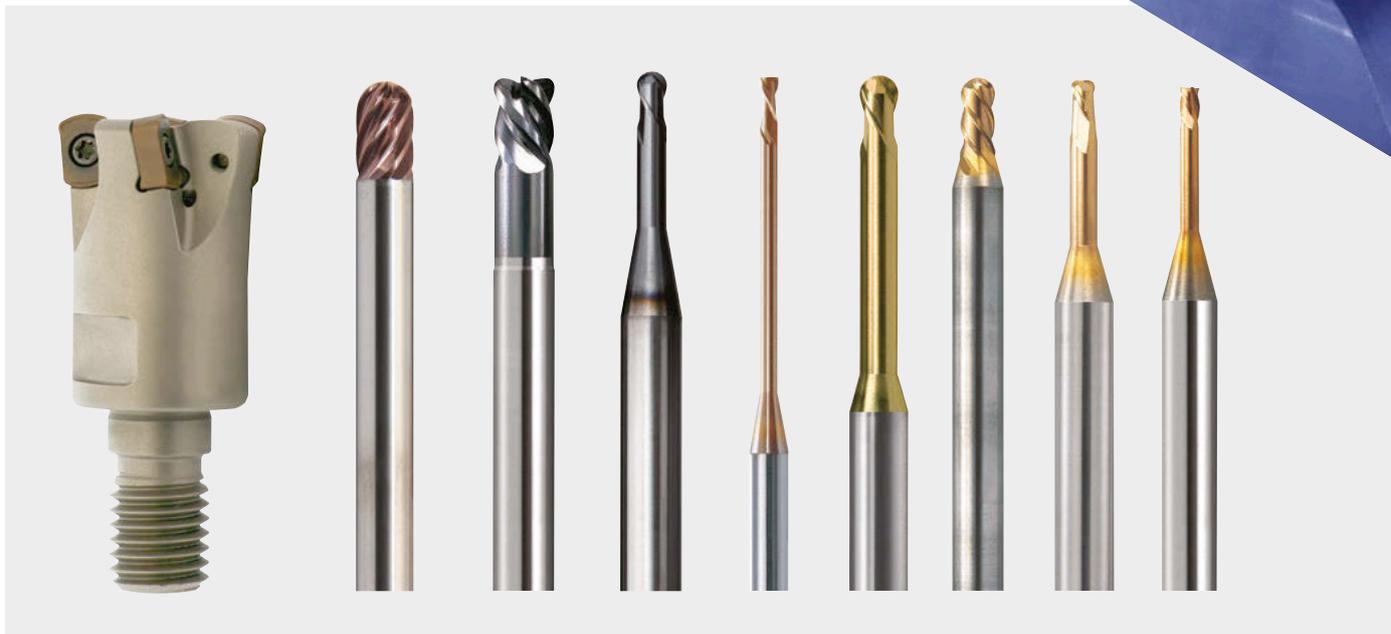
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- Machining case studies p34 - XYZ Machine Tools/Westin Engineering; Whitehouse Machine Tools/Metaltech Precision Engineers; Mills CNC/Baker Engineering; Haas Automation/Carbinium Engineering
- Machine product news p45 - GF Machining Solutions; Grob Machine Tools; WH-Lead; Mills CNC



This XYZ Machine Tools' UMC-5X is supporting gear-cutting at Kenward Engineering, part of Westin Engineering

XYZ Machine Tools UMC-5X delivers gear-cutting capability for Westin Engineering

Celebrating its centenary in 2021, Huddersfield-based Westin Drives provides 24/7 service and repair facilities for electric motors and other electro-mechanical equipment. Any machining that it required was either subcontracted or carried out using the company's single manual centre lathe.

Five years ago, the decision was made to bring machining in house to address logistical issues associated with its low-volume subcontract requirement. With no prior machining knowledge, the company has transformed itself into what today is Westin Engineering. And the company has just taken delivery of its first 5-axis machining centre, a XYZ UMC-5X supplied by XYZ Machine Tools (www.is.gd/oxorop). The machine joins two turning centres and a fourth-axis-equipped vertical machining centre that boasts turning capability, all also supplied by XYZ Machine Tools.

Initially, these machine investments were targeted purely at supporting Westin Drives' services. However, things rapidly developed and, with strategic acquisitions, Westin Engineering has grown to become a full-service subcontract machinist itself, offering everything from reverse engineering single components to volume production for a diverse range of industries.

"Our primary priorities were the milling and turning capabilities, which saw the arrival of the XYZ 1020 VMC with an optional fourth-axis, this allowed us to machine larger bearing housings, while the XYZ SLX 425 ProTurn

lathe was ideal for one-off and low-volume turning work to support Westin Drives," explains Fraser Lynch, director, Westin Engineering.

While these two machines enabled the company to support its sister company, the next major development came in 2017, with the purchase of Kenward Engineering, a gear-cutting specialist, followed by the acquisition of general subcontractor, Kingsmith Engineering. These two developments brought with them a need for further machining investment.

"Much of the machining capability of these two businesses was either specialist gear cutting equipment or dated turning and milling machines, so we needed to invest further; particularly in turning and milling capacity," says Lynch. We looked at mill-turn machines, but after speaking with XYZ Machine Tools we decided to choose their XYZ CT65 LTY turning centre with LNS barfeed capability. The Y-axis and live tooling on our two CT65 LTYs meant we could transfer a lot of work directly to them and reduce the number of operations required from four or five in some cases down to just two operations maximum. The barfeed allows us to run unmanned throughout the night. During the day, the two machines are managed by a single operator, giving us significant efficiency gains as for a vast majority of work. These two machines can achieve the work output of two lathes and two machining centres."

With the bulk of the turning and milling now



accounted for, attention turned to gear cutting. The acquisition of Kenward brought with it several specialist gear-cutting, shaping and hobbing machines, but Westin Engineering was looking for greater versatility. Especially for one-off or low volume manufacture, where the cost of specialist gear-cutting tooling was prohibitive. Smaller shaft and pinion work could be accommodated on the XYZ 1020 VMC, but larger diameter gears posed a problem. The solution was an XYZ UMC-5X simultaneous 5-axis machining centre (600 by 600 by 500 mm in X, Y and Z, plus a 600 mm diameter trunnion rotary table capable of 90 rpm).

“We discussed our requirement with the applications team at XYZ Machine Tools and through their recommendation we contacted Don Tyne Gear Systems, a specialist gear design company whose software can generate gear data that can be transferred to our Open Mind CAD/CAM [www.is.gd/lamemu] allowing the machining of the full tooth form utilising the simultaneous 5-axis capability of the XYZ UMC-5X,” he continues.

The combination of software and the Siemens control on the UMC-5X make gear design and manufacture almost conversational. By eliminating the reliance on highly skilled personnel, time-consuming calculations and expensive gear-cutting tooling, it meant Westin Engineering could provide a quick response and dramatically shorten lead times for this type of work. A further advantage is that by making use of sister tooling in the UMC-5X toolchanger (with up to 60 positions), the machine can run lights out.

Concludes Lynch: “Using the standard probing and the integrated Smart Machining Technology on the

UMC-5X, we can monitor tool wear or set the machine to switch to sister tooling after a set number of teeth have been cut to maintain production overnight, all while using standard tooling, such as ballnose cutters.

“We see a lot of potential on the machining side and we are identifying a lack of supply capability for machining, especially where it involves more than just making to print and there is a requirement for engineering input. Our investment is enabling us to cut lead times on work such as this and working with XYZ Machine Tools has additional benefits through their close working relationships with other suppliers; such as Open Mind and Ceratizit [www.is.gd/daxita], while the ProtoTRAK and Siemens controls bring added flexibility to our work. Add to that the cost-benefit of the XYZ machines and it all makes perfect sense.”

Spinner 5-axis brings massive & beneficial change to pump machining at Metaltech

A fundamental change to the way stainless steel pump bodies are machined by subcontractor Metaltech Precision Engineers is resulting in far-reaching benefits. They include a drastic reduction in set-up time that lowers economic batch size by a factor of four, shorter lead times, faster cycles, savings in the cost of tooling and less wear on the machine tool.

Additional advantages of the new production route are reductions in power consumption and in space taken up on the shopfloor – both are in short supply at the firm’s Hailsham, East Sussex, factory and were the main drivers in the company’s search for an alternative manufacturing process.

Expensive 500 or 630 mm twin-pallet, 50-taper horizontal machining centres (HMCs) with boxways and high spindle torque, of which there are nine on site, together with CNC lathes, have underpinned pump body production since the company was established in 1976. The components are typically produced in five operations on three machines.

A 40-taper, 5-axis, vertical-spindle machining centre, a German-built Spinner U-620 without a pallet changer (620 by 520 by 460 mm in X, Y and Z; C-axis of 360° and B-axis of +50°/-110°), supplied as a turnkey package by sole UK agent Whitehouse Machine Tools (www.is.gd/bupuju), now machines the components in two operations. Installed and made operational within one week during November 2019, the cell heralds a progression at Metaltech from the use of raw power to smart machining.

The pump bodies in question, of which there are eight types ranging in diameter from 160 to 280 mm with numerous different port details, are produced for a customer in batches of 50 to 60 to a monthly schedule that might include as many as 15 component variants.



Metaltech Precision Engineers has scored multiple benefits through the installation of this Spinner U-620 5-axis machining centre

Sometimes orders were impossible to fulfil and discussions with customers regarding alterations to the schedule had to be undertaken.

That was because the traditional machining process takes 10 to 15 hours to set up. After skimming the back face of a 316 stainless steel casting, it involves roughing the same face on an HMC and then roughing the front face, bores and ports on the same machine. The part is transferred to a lathe to turn the port details using single-tip boring bars. It then returns to an HMC to re-skim either the front or back face to provide a location for mounting the part on a window fixture to finish-machine both faces. Production of a batch of 50 to 60 bodies takes four weeks by this method.

In contrast, set up on the Spinner takes just one hour and the new process route is completed in two clampings, which means that 10- to 15-off can now be produced economically. In the first operation, roughing and finishing of the back face and the interpolated bores are carried out by respective 16 mm diameter, solid carbide end-mills from MA Ford (www.is.gd/olavig).

A Schunk (www.is.gd/odeyew) pneumatic zero-point fixturing system presents the part to the spindle for the second operation in a time that rivals the speed of an automatic pallet changer. A probe double-checks the datum and that the bores machined in the first operation are the correct size. Face-mills complete the rough and finish machining on the front of the pump body. The savings offered by this method of production sees all 50 to 60 bodies completed in one week rather than four.

Metaltech's managing director, Doug Murphy, comments: "We sent drawings to Whitehouse and they came back with set-up and cycle times on the Spinner

that looked really good, which was largely down to producing the bores by circular interpolation milling instead of single-point turning on a separate lathe.

"We were worried that it would be difficult to hold the required 20-micron diameter tolerance using this method. However, our fears were allayed by a set of three cutting trials the supplier carried out in its Kenilworth showroom. We checked the bores on our CMM for size, ovality and taper and they were within microns."

Technical director Mick Bignell adds: "Another concern we had was that the new method of roughing and finishing the back face completely before turning the part over to machine the front face and outside would put stress into the casting, causing distortion and movement of the datums. This also proved to be unfounded.

"We had to look carefully at the surface finish of the internals and bores, as these rotary lobe pumps are used in the food industry and any roughness could cause hygiene problems. External finish is also important to our customer, as the polished appearance is a sales advantage. The interpolation milling cycles established by Whitehouse have proved to be equal to these requirements and produce a finish equivalent to single-point turning."

Savings in tooling costs result from the new production method. The first thing to note is that on the HMCs, which use large indexable-insert cutters for roughing, the 60-station tool magazines are not big enough to accommodate all cutters needed for every pump variant. On the Spinner, with the new process allowing commonality of tooling, the 32 pockets are sufficient to machine the complete range.

Using a waveform rough milling strategy with the 16 mm diameter cutter at high speeds and feeds, typically 2,700 rpm and 2,400 mm/min, rapid metal removal rates are achieved without unduly heating and stressing the part, helping to maintain accuracy. It is largely this lighter machining that allows the BT40 vertical-spindle machine to attain the same level of precision as a 50-taper HMC when cutting tough stainless steel.

Tool life is very good, according to Bignell, who says that one 16 mm end-mill can rough 22 pump bodies, while a finishing end-mill had completed 50 parts and was halfway through the next batch at the time of interview. A further benefit of these £120 solid carbide cutters is that two or three regrinds are possible at a cost of £25 per time. Overall, the lower cost of tooling represents a monetary saving that Bignell describes as "immense".

A further economy derives from reduced power consumption. The Spinner draws between 10 and 20 A, whereas an HMC pulls 30 to 40 A. Murphy estimates that overall electricity usage will fall by two-thirds using the new pump body manufacturing process.

(Continued on page 41)

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As machining gets more complex and customers expect more for less, the need to simulate, verify and optimise the machining process has never been more necessary, in order to ensure reliability and efficiency, and to maximise productivity

The highest level of NC simulation and verification is achieved using a highly accurate digital twin representation of a CNC machine, which is driven by the same post processed NC G-code that the machine itself employs. A digital twin sees the real-world component manufacture processes digitally replicated within software.

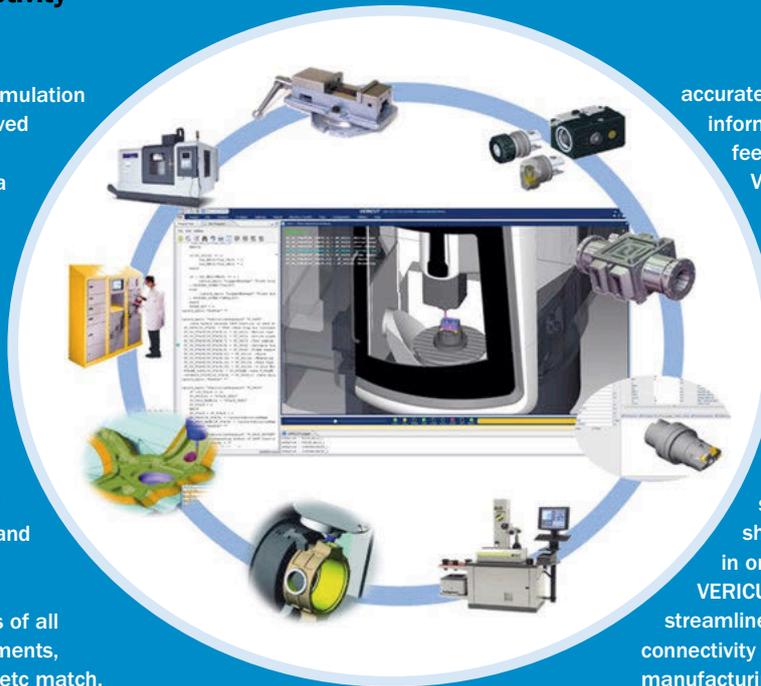
There are two critical issues – is the virtual model correct, matching the physical one, and are the subroutines and parameters available in the machine CNC being used.

It is key that virtual models of all machine components, attachments, fixtures, clamps, cutting tools etc match, as closely as possible, to what is being used on the shopfloor. The more accurate the simulation is, the more reliable it will be in providing dependable outcomes.

If shortcuts are taken – like omitting input data, relying on rough block sizes or using generic tools – it's likely that surprises, issues and errors will arise later – inconvenient and expensive on the shopfloor. This is where CGTech's VERICUT's connectivity comes in.

Second, the virtual machine should use the actual parameters, subroutines and probing logic taken from the machine tool, making the digital twin behave in an identical fashion to that of the real machine tool.

VERICUT has access to the most current information available and ensures that the virtual machine and simulation correspond as closely as possible. VERICUT can directly connect and communicate with multiple sources of software, including CAD/CAM, tool



VERICUT offers seamless integration with various sources of digital information, such as CAM systems and tool management systems, as well as cloud-hosted data services

management systems and data from vendors and the cloud.

Using direct interfaces with all leading CAM systems, VERICUT creates a seamless integration between the CAM system and simulation software, which streamlines data flow, avoids replication, eliminates human error and makes the transfer for multiple set-ups and operations quick and easy. Different stock models, design or finished parts and fixtures can be selected and imported into VERICUT ready to run a simulation.

Likewise, with connections to various tool management systems, including Machining Cloud, Novo and Zoller etc, VERICUT can access a central source for cutting tool information and obtain highly

accurate tool models. Other information such as speeds and feeds can be brought into VERICUT from the TDM system and used by programmers as a guideline to ensure that tools are not being over- or under-utilised, or as a starting point for optimising programs.

Connectivity also goes beyond the information imported into VERICUT, extending to the resulting simulation data that can be shared with other departments in order to improve efficiency. VERICUT has various tools that streamline communication and connectivity throughout the manufacturing process.

As well as reports that can be configured to run automatically after the simulation, log files, cutting data and images, VERICUT offers a complete Reviewer file. This is a file that can be opened by any Windows PC or tablet and allows users to view the full simulation. It's a 3D representation of the simulation that can play forward and backward while removing and replacing material. The user can rotate, pan and zoom, just like normal VERICUT, and the cut stock can be measured using all the standard X-Caliper tools. Tools such as Reviewer and Reports allow complete visibility throughout the manufacturing process of how parts should be produced and connects the entire workflow together.

Accurate simulation data means that the planning and scheduling department will have a better indication of cycle times, tool life information will be available for pre-setters, machinists will have confidence that the fixtures and



programs are going to run correctly, NC programmers can be assured that the process is actually producing the part as intended and process engineers and quality control can easily trace errors or issues in the design or NC program. All this data can be collated before any actual machining is done, without wasting machine time, and can be fed back to high level personnel for operational planning and budgeting.

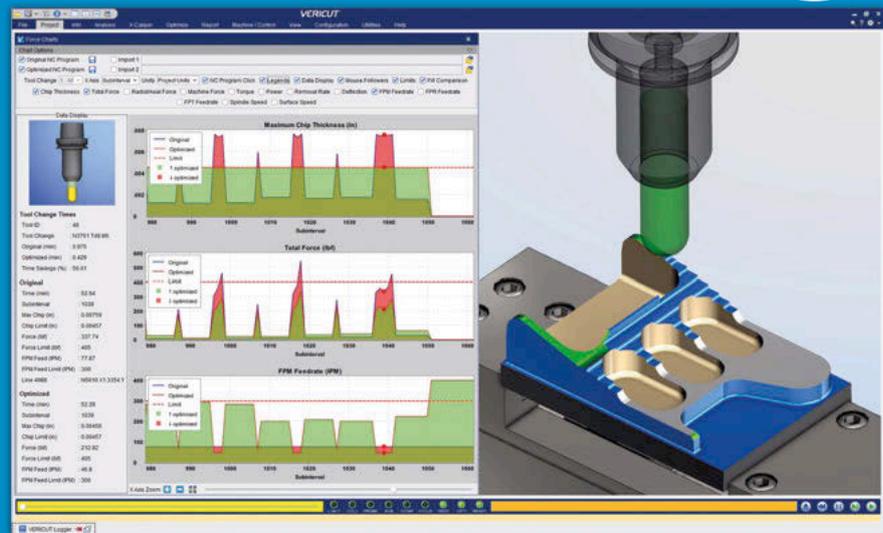
So, when the virtual world matches the real world, chances for surprises are massively reduced, the manufacturing workflow operates more efficiently and maximises time and therefore cost savings. VERICUT connects the process together and ensures that the most accurate and reliable representation of the real world is achieved.

Turning now to process optimisation, this links all the machining operations, end-to-end, to evaluate and improve the entire manufacturing process. Each step along the way, through engineering, design, CAM programming and machining and up to the final quality and inspection phase, can and should be optimised. Simulation ensures programs are error-free and that all operations work together as intended, but optimisation ensures the whole process is operating as efficiently as possible, saving time and money.

As machining gets more complex and customers expect more for less, there is room for improvement in any manufacturing process. These improvements – which are not just about reducing costs – might include reduced NC program runtimes, increased throughput, making parts cheaper or getting a product from start to finish and out to market faster.

VERICUT CNC simulation and verification software does a superior job in finding problems that may be hidden within NC programs and warning users of unexpected machine behaviour, even those occurring between multiple machine set-ups. It lets programmers resolve these issues before they reach the shopfloor, crash the machine and waste valuable machine time.

With VERICUT, the shopfloor can be confident that programs will run correctly and the free VERICUT reviewer at the machine tool is a huge benefit to both shopfloor and programmers, as it avoids “what happens next?” concerns during



Force and Force analysis charts – The impact of optimising is dramatic, including reduced machining time and longer tool life, which will help the shopfloor by giving more machine capacity and maybe even postponing the purchase a new expensive machine. There will be less post machine clean up because produced parts will be better quality saving even more time per part. Programmers are going to benefit from having correct speeds and feeds information to achieve consistent machining results. All these positives reach all the way back to the quoting and estimating and mean manufacturers can be more aggressive and competitive with schedules and bids

one-off or first-off production.

There's also a positive ripple effect for other departments that coordinate with programming. Engineering and design can learn through verification whether parts can be manufactured or if changes need to be made before metal cutting. Planning and scheduling will have more accurate cycle times and they won't have to schedule prove-out times on the machines. The quality control and inspection team can expect higher levels of conformance and fewer quality issues, which makes it easier to approve parts and get them delivered.

These are all areas where VERICUT is helping save time and money. But there are also the hidden issues, inefficiencies and missed opportunities to optimise processes that erode profit margins. Things like poor cutting methods, non-optimal feedrates in new and existing NC programs, over- or under-utilising cutters and/or machine tools, all of which can be draining money with every part made. Some companies work really hard and very diligently optimising programs, but there are opportunities and savings to be had for all machine shops. This is where Force and Force analysis charts come in.

VERICUT Force recalculates feedrates to maintain ideal constant chip thickness while simultaneously reducing feedrates when needed to maintain safe cutting

forces and spindle power, and it does this for each tool. Force is based on calculations and proven cutting data that's been gathered from tooling manufacturers, material specifications and dyno testing.

It uses very specific cutting parameters, takes into consideration what kind of material is being used, as well as tool type and geometry. Force couples this with the cutting conditions that VERICUT collects to give the best data that can be used to analyse and optimise the NC program.

Force charts visualise what's happening during the machining process and expose areas of opportunity that exist in each NC program, such as erratic chip thickness, chip thinning and inefficient CAM paths that can all be resolved by optimising feedrates. The charts also show areas of concern, for instance where the force exceeds what the tool capable of, such as excessive cutting conditions or potential for chatter, broken/chipped cutters or damage to part of the machine. In these instances, VERICUT Force will lower the feedrate to keep the force under the limit that of the tools capability.

Simulating, verifying and optimising simultaneously with VERICUT Force equates to a cumulative effect on process optimisation, resulting in significant time and money savings. ■



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He concludes: “As demand for these pumps is continually rising, finding more efficient ways of manufacture is imperative. The reduction in set-up time from as much as 15 hours to one is a big game-changer with the Spinner, as is the elimination of work-in-progress.

“The process has lowered the economic batch size and is helping not only to increase flexibility of production but also to reduce the cost. Also, by handling the parts fewer times, there is less risk of scrap. The customers also benefit, as they are able to reduce stocks levels.

“The ability of Whitehouse to turnkey this installation successfully has given us a path to expansion that was difficult to see before. We were out of space and out of power here in Hailsham and the high cost of relocation was not an option.

“The Spinner U-620, requiring half the floor space of an HMC and one-third of the power yet delivering the same quality of parts four times faster, has been a sea-change for us.”

Doosan DVF 5000 5-axis machining centre delivers multiple benefits for Baker Engineering

Significantly reduced machining operations leading to reduced part cycle times, improved operational efficiencies and new business wins are just some of the benefits Baker Engineering is experiencing with its latest Doosan 5-axis machine tool investment.

Mills CNC (www.is.gd/ugoyob), the exclusive distributor of Doosan machine tools in the UK and Ireland, has recently supplied the company, a leading precision toolmaker and engineering subcontract specialist based in Derby, with a new, high performance Doosan DVF 5000 5-axis machining centre (625 by 450 by 400 mm in X, Y and Z; 500 by 450 mm work table, 400 kg table load).

The machine was installed at the company’s new, purpose-built 8,000 ft² facility in April 2020 and is being used to machine a diverse range of high precision parts, as well as specialist tooling, jigs and fixtures for Baker’s growing UK and international customer base.

The DVF 5000 is the company’s second Doosan machine tool; Baker Engineering previously installed a new DNM 6700 vertical machining centre in February 2017.

The family-owned operation employs 15, boasts ISO 9001: 2015 accreditation and is committed to continuous improvement, making regular investment in latest machine tool and ancillary manufacturing technologies to maintain competitiveness and



This Doosan DVF 5000 has delivered both increased efficiency and new customers for Baker Engineering

strengthen its preferred partner relationships with its customers. The firm’s machine tool complement includes machining centres with integrated fourth-axis units, lathes with bar feeders and wire EDM machines.

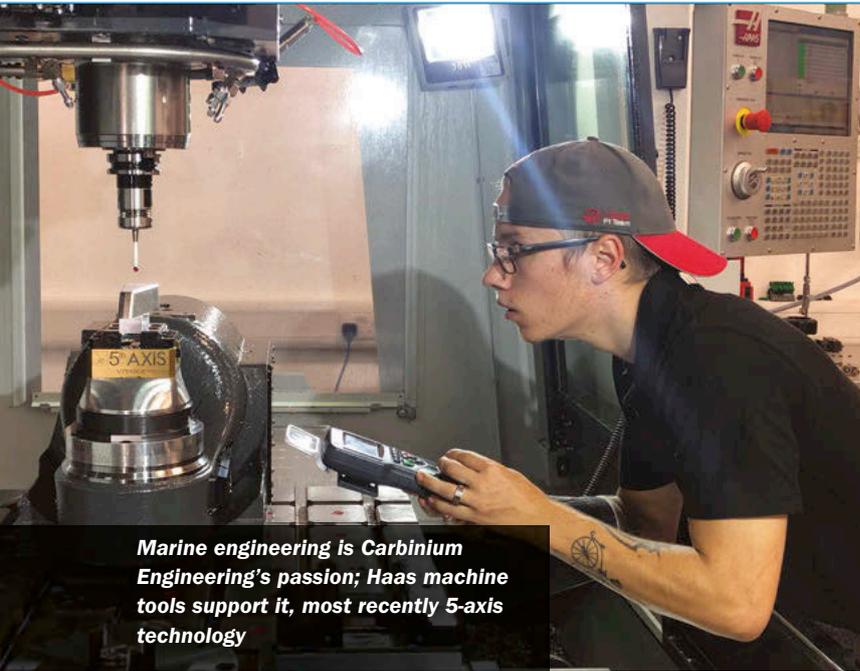
Apart from precision subcontract machining services, the company also has specific strengths in manufacturing aerospace component tooling (i.e. jigs and fixtures for ground support maintenance), tooling for the measurement and inspection of railway tracks and tooling used in the power generation sector.

The decision to invest in 5-axis machining technology was a natural one for Baker Engineering to make and had begun, in earnest, earlier in 2019. Explains director Adrian Baker: “Multi-axis and multi-tasking machine tools help manufacturers improve their productivity. Because we are a company that’s looking to constantly improve, we had done our homework into the technology and could see that an investment in a 5-axis machine tool would deliver significant performance benefits.

“In addition, the investment would send the right signals, externally and internally, that Baker Engineering was focused on the future.”

Key advantages anticipated by investing in 5-axis machine tool technology were immediately apparent to management and staff at the company and included: the ability to machine complex shapes/parts in a single set-up; the added benefit that ‘one-hit’ machining has on reducing the time to procure, and costs associated with, fixturing; plus the ability to improve/maintain part accuracies, owing to a reduction in work handling. “Since the DVF 5000 machine’s installation, we have experienced all of these benefits,” adds Baker.

In one example that demonstrates the benefits, an electrical-housing-type component was originally machined in five separate machining operations taking 2.5 hours. When machined on the DVF 5000, the number of operations is reduced to two and the cycle time is 0.75 hours.



Marine engineering is Carbinium Engineering's passion; Haas machine tools support it, most recently 5-axis technology

Says Baker: "That is typical of the results we have been able to achieve since we invested in the machine." Of the choice of a Doosan machine, he adds: "We had invested in a DNM 6700 vertical machining centre from Mills CNC in 2017. We have been pleased with the machine's performance and reliability, and have been impressed with Mills' after-sales service and support. When considering the 5-axis machine tool investment, it was natural that we approached them to discuss our requirements."

And as well as helping the company increase its productivity and efficiency, the machine has also aided Baker Engineering in winning new machining work. Baker again: "News travels fast. "On hearing that we had invested in Doosan 5-axis machine tool technology, a new customer made contact with us, asking us to quote on a job. We have successfully turned the enquiry into an order."

"Our decision to invest in the Doosan DVF 5000 has been vindicated. The machine has significantly strengthened our machining capacity and capabilities. It is fast, accurate and reliable, and represents great value."

Haas 5-axis delivers more capability to marine engineer Carbinium Engineering

Ben and Genevieve Collett established Carbinium Engineering, a bespoke design and manufacturing facility, to serve the marine industry, a passion for the pair for many years. The company undertakes a wide variety of projects in the marine, motorsport and aerospace sectors, and specialises in making one-off and low-volume items, alongside regular small production runs. The company tackles a wide range of

materials, which including carbon fibre, metals, plastics and timber. After opting for Haas machine tool technology, the company's latest purchase is a Haas VM3 vertical machining centre fitted with a TRT160 2-axis rotary table (1,016 by 660 by 635 mm in X, Y and Z; 160 mm diameter rotary table platen with 36.3 kg handling capacity).

In 2019, Carbinium Engineering moved into new premises at the Scottow Enterprise Park in North Norfolk. At the same time, the firm expanded its CNC capacity, purchasing two new Haas machines (www.is.gd/irakif), a VF2-SS vertical machining centre and an ST-15 turning centre. Ben Collett explains: "We looked at several suppliers before we chose Haas. For us they represented the right balance of specification, value and support. The training we received, both on site and at their training centre at the Haas F1 showroom in Banbury, was excellent. The large number of 'tips and tricks' videos they have on *YouTube* have also been really helpful. Their headquarters, in Norwich, are just down the road, and knowing that there's a strong local service and support gives us great peace of mind."

Projects have ranged from prototype components for supersonic rockets through to parts for sub-sea surveys, but the majority of the company's work is for yacht builders, including Spirit Yachts, who recently launched a 34 m sailing yacht, the Spirit 111. This unique build used a variety of both interior and exterior parts designed by Carbinium, including 3D-machined solid timber, composite mould tools, hydraulically powered deck gear and multi-link hinges.

A year on and Carbinium Engineering has invested in another Haas machine; a Haas VM3 vertical mould making machine with 12,000 rpm spindle and 30+1 side mount toolchange with TRT160 2-axis rotary table. Says Ben Collett: "The VM3 gives us a bigger machining envelope for larger parts and we now run several components in one operation. The 5-axis capability cuts down on multiple set-ups and allows us to get jobs through with less operator intervention. It also enables us to undertake more complicated parts that require simultaneous 5-axis machining. "Making one-off and low-volume parts we need to be very efficient. We use fully integrated CAD/CAM and output G-codes to our machines directly from our software, so parts go from design to manufacture completely within our computer system, without the need for any printed drawings and instructions. The Haas wireless probing system is a great help in reducing set-up time, allowing us to position work swiftly and check tightly toleranced components. It's great to be able to work on such a variety of projects, all under our own roof." ■

IN THE HIGH COURT OF JUSTICE
BUSINESS AND PROPERTY COURTS OF ENGLAND AND WALES
COMPANIES COURT (ChD)

IN THE MATTER OF QBE UK LIMITED
and
IN THE MATTER OF QBE EUROPE SA/NV
and

IN THE MATTER OF THE FINANCIAL SERVICES AND MARKETS ACT 2000

Notice is hereby given that on 1 July 2020 an application was made under section 107 of the Financial Services and Markets Act 2000 (the Act) in the High Court of Justice, Business and Property Courts of England and Wales, Companies Court (Chd) in London by QBE UK Limited (QBE UK) and QBE Europe SA/NV (QBE Europe) (together, QBE) for orders:

- (1) under section 111 of the Act sanctioning a scheme (the Scheme) providing for the transfer to QBE Europe of all of the general insurance and reinsurance policies written on a freedom of services basis throughout the European Economic Area (EEA) from QBE UK's head office in the United Kingdom (UK) between 1 January 1970 and 31 December 2018, which:
 - (a) relate solely to a risk (or risks) situated in an EEA member state;
 - (b) relate to a risk (or risks) situated in an EEA member state and the UK; or
 - (c) relate to a risk (or risks) situated in an EEA member state and another jurisdiction (other than the UK); and
- (2) making ancillary provisions in connection with the Scheme pursuant to sections 112 and 112A of the Act.

A copy of the report on the terms of the Scheme prepared by an independent expert in accordance with section 109 of the Act (the Scheme Report), a statement setting out the terms of the Scheme, a summary of the Scheme Report and the Scheme document may be obtained free of charge by contacting QBE UK or QBE Europe using the telephone number, postal address or email address set out below. These documents and other related documents, including sample copies of the communications to policyholders, are available via the QBE website (<https://qbeurope.com/>). This website will be updated for any key changes to the proposed transfer.

Any questions or concerns relating to the proposed Scheme should be referred to QBE by telephone at +44 (0)20 3465 3330, email at brexit.queries@uk.qbe.com or post at 30 Fenchurch Street, London EC3M 3BD, United Kingdom.

If you have a policy with QBE UK, please quote your policy number in any correspondence. This can be found on your policy documentation or related correspondence.

The application is due to be heard at the High Court of Justice of England and Wales, 7 Rolls Buildings, Fetter Lane, London EC4A 1NL, United Kingdom on 21 October 2020. Any person who thinks that he or she would be adversely affected by the carrying out of the Scheme, or objects to the Scheme, may attend the hearing and express their views, either in person or by representative. It is requested that anyone intending to do so informs QBE, at the addresses provided above, in writing as soon as possible and preferably before 14 October 2020 to set out the nature of their objection. This will enable QBE to provide notification of any changes to the hearing and, where possible, to address any concerns raised in advance of the hearing.

Any person who objects to, or considers they may be adversely affected by, the Scheme but does not intend to attend the hearing may make representations about the Scheme by giving written notice of such representations to QBE at the addresses provided above or by calling the dedicated telephone number provided above, in each case as soon as possible and preferably before 14 October 2020.

QBE will inform the UK's Financial Conduct Authority and Prudential Regulation Authority of any objections raised in advance of the hearing, regardless of whether the person making the objection intends to attend the hearing.

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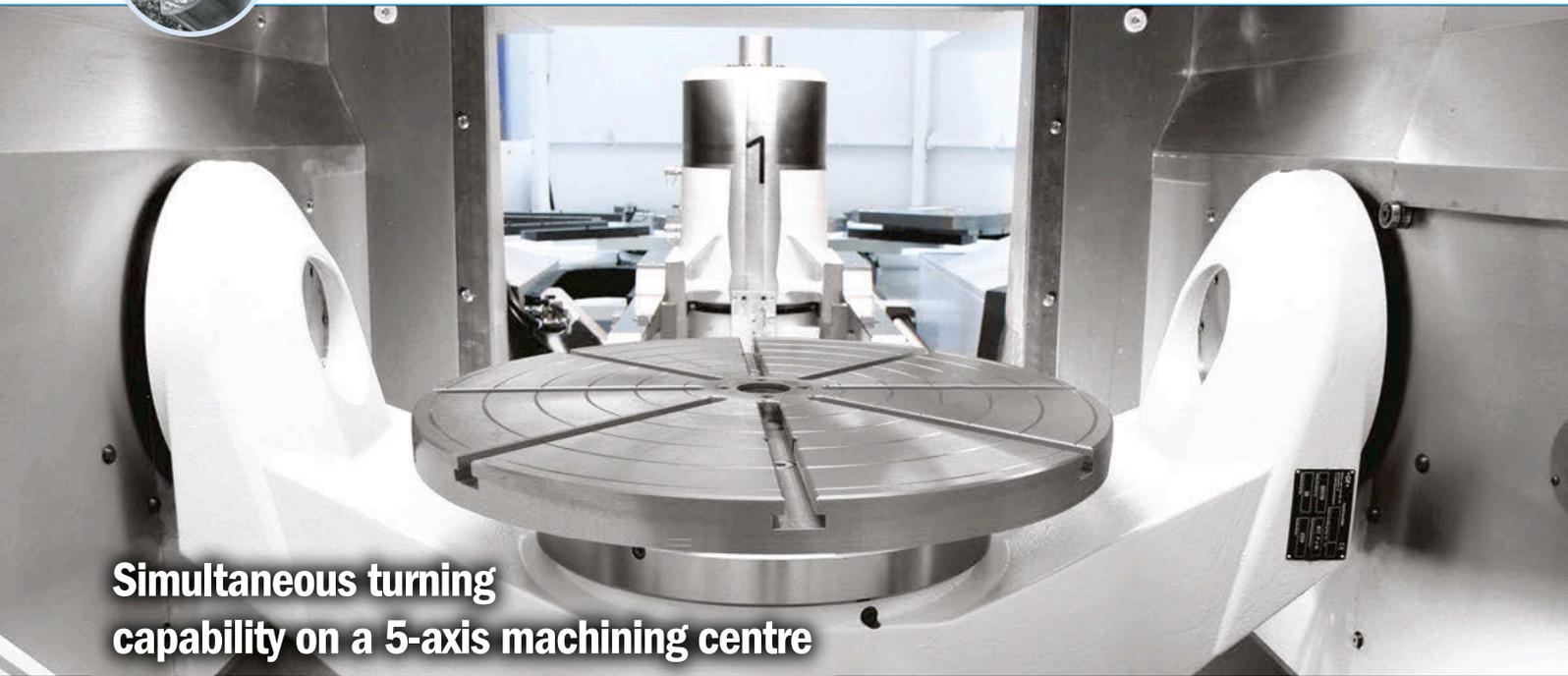
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Simultaneous turning capability on a 5-axis machining centre

GF Machining Solutions (www.is.gd/zuredi) has introduced the gantry-type Mikron MILL P 800 U ST machining centre, which integrates milling and turning in a single machine, to its machine tool portfolio. The compact unit has 800 mm of X-axis travel, a 500 by 730 mm table, an 800 rpm C-axis rotation speed and a maximum table load of 800 kg. The machine's small footprint makes it easy to integrate into facilities where space is at a premium, being able to replace two machines, the company says.

The combination of milling and turning technology in a single machine helps manufacturers improve productivity, accuracy and cost effectiveness, while the MILL P 800 U ST achieves perfect workpiece roundness, superior surface finishes and high material removal rates, says GF Machining Solutions.

The 5-axis simultaneous MILL P 800 U ST is also capable of four-axis simultaneous turning, a capability often required by customers that need to have the cutting tool positioned at a 90° angle to the workpiece surface to avoid tool shape errors. The machine incorporates a 20,000 rpm HSK A63 spindle – the industry's fastest for a milling and turning machine of this size, the company claims.

Additionally, water-cooled torque motors on the A and C axes ensure accuracy and stability, while speed is enhanced through the axes' 0.3-second clamp time in any position.

With the new machine's gantry concept, the workpiece on the 500 by 730 mm table is fully accessible, without rotating the table. This eliminates errors related to table rotation and avoids the need for hand polishing. The toolchanger for the machine is also located so as to avoid moving the table during tool changes.

GF Machining Solutions' Machine and Spindle Protection (MSP) facility adds security to the machining process by protecting the machine and spindle against

crashing during set-up and machining. As the only system on the market to offer protection in all directions, MSP eliminates spindle damage, misaligned machine geometry, downtime and costs related to unexpected spindle crashes.

The MILL P 800 U ST is automation-ready and equipped with pallet changers for two, seven, nine or 12 pallets. Supplied with either a Heidenhain or Siemens control, it can hold up 215 tools in its ATC. The machine can also be easily integrated into existing automation systems, including System 3R automation solutions.

The gantry-type Mikron MILL P 800 U ST machining centre, which integrates milling and turning in a single machine

Grob introduces accessible 3+2-axis machining range

Grob Systems' (www.is.gd/arotob) Access Series 5-axis machining centres are said to promise the best machining quality for individual and series production while offering a cost-conscious entry into Grob technology.

Typical applications for the Access Series include 3+2-axis machining and volume cutting (structural components) in the aerospace, automotive, pump and valve, mechanical engineering and subcontracting.

Built in the USA, the Access Series machines includes the basic models G350a (600 by 770 by 805 in X, Y and Z) and G550a (800 by 950 by 1,020 mm in X, Y and Z), which are backed by Grob's more than 90 years' experience.

Both models include a rigid horizontal spindle axis optimally positioned close to the operating point to guarantee maximum accuracy and precision. This combination, with the unique upside-down machining, offers excellent chip fall and reduces the heat load in the





component. The models offer the longest Z-axis stroke and largest swivel range on the market for rotary axis machines. The linear guidance system of the reference axis can be optionally equipped with a temperature-controlled cooling function, and a wide-opening work area door ensures safe access and ergonomic working, with maximum machine safety. Plus, large safety glass provides a perfect view of the machining process. The Access Series is compatible with Siemens and Heidenhain control systems.

Leadwell BC-600 adds to existing range, offering smallest working envelope in the series

Taiwanese machine tool builder Leadwell CNC Machines has introduced a new model, BC-600, at the smaller capacity end of its of BC-series of 5-axis machining centres. On all four models in the range, the rotary axes are provided by a $\pm 110^\circ$ B-axis spindle and an integrated C-axis rotary table, both of which may be interpolated with X, Y and Z to allow full 5-axis production.

The competitively priced, highly specified machines, which are fitted with scales in the linear and rotary axes as standard, are available in the UK and Ireland through recently appointed sole sales and service agent WH-Lead (www.is.gd/tahinu).

A notable feature of the 12-tonne BC-600 is its generous working envelope for the nominal 4.7 by 3.8 m footprint. Travels in X and Y are 1,100 mm and 610 mm respectively, while in the Z-axis components 610 mm tall can be machined with the spindle in the vertical orientation, rising to 790 mm with the spindle horizontally positioned. Cutting feed rate is up to 10 m/min, while rapids are 36 m/min in X and Y, 30 m/min in Z for short idle times and high productivity.

The flush, 600 mm diameter rotary table accepts workpieces weighing up to 400 kg, but the full 1,280 by 610 mm fixed table is able to accommodate 1,400 kg components for 3- or 4-axis machining. The C-axis uses a direct-drive motor to provide high torque and rigidity and to avoid the backlash normally associated with worm gear drives. Maximum standard rotational speed of the C-axis table is 120 rpm but there is an optional 800 rpm version to provide turning capability.

The tilting spindle, which can be positioned to within 20 seconds of arc, is driven at up to 15,000 rpm (optionally 10,000 or 12,000 rpm) by an 18.5 kW motor. It is replenished automatically with 40-taper or HSK-T63 cutters from a 40-station tool magazine. The spindle's rigidity, coupled with the wide machine column and base and the use of linear roller guideways in the orthogonal

axes with dual-nut, 40 mm diameter ballscrews in X and Y, allows for rigorous machining duty.

Controls are Heidenhain TNC640 with a DCM function to minimise the risk of a collision during 5-axis cycles and KinematicsOpt geometry error compensation; Siemens 840D with either full 5-axis or 4+1 interpolation; or FANUC OMiF, available with 4+1 capability only.

Two more 5-axis models added to Doosan DVF range

Mills CNC (www.is.gd/ugoyob) has added the DVF 6500 (650 mm diameter table) and the larger capacity DVF 8000 (800 mm diameter table) units to the existing Doosan DVF 5000

machine successfully launched in the UK and Ireland some 18 months ago.

Both machines are compact and have a rigid and stable structure for increased accuracies, improved surface finishes and greater process reliability. They are also fast, boasting 45 m/min rapid rates, and are equipped with oil-cooled, directly driven BT40 spindles (up to 22 kW/18,000 rpm).

The machines also feature servo-driven automatic toolchangers (up to 120 tools) with a 1.3 second tool-to-tool changeover time, roller LM guideways that deliver increased speed, accuracy and reliability, and direct-drive rotary tilting tables (A-axis is $+120/-120^\circ$; C-axis is 360°). Thermal compensation systems (spindle and structure) and a long-life, grease lubrication system are other machine features.

FANUC 31iB5, Heidenhain TNC640 or Siemens 840D with ShopMill software can be fitted, while a Collision Protection System can also be supplied as an option.

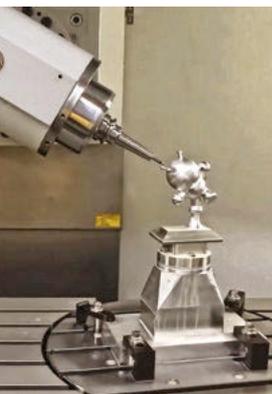
Both machines can also be supplied with a range of different automation solutions that increase their productivity and enable manufacturers to take advantage of unattended and lights-out operations.

The DVF 6500 offers 750 by 785 by 600 mm in X, Y and Z with a table load of 1,000 kg, while the DVF 8000's equivalent figures are 1,000 by 900 by 685 mm and 1,400 kg.

A further variation is that a DVF 8000T model has a turning capability, although the machine then has a lighter maximum table load of 700 kg and faster C-axis speed of 600 rpm. ■



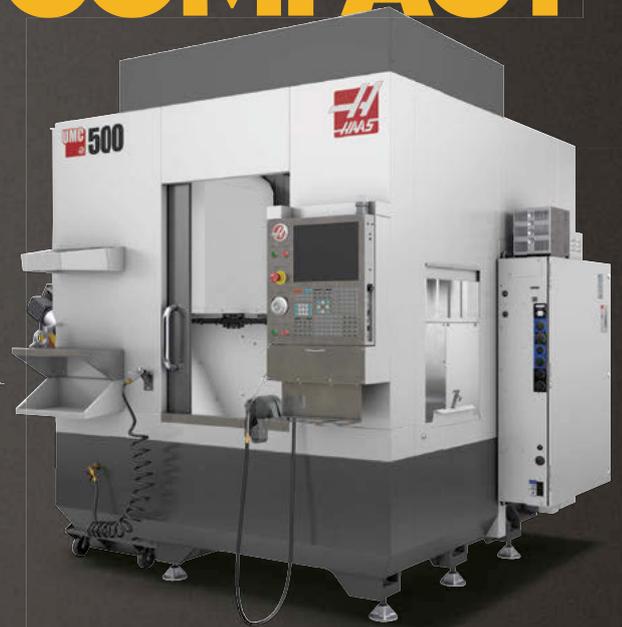
The BC-600 is at the smaller capacity end of Leadwell CNC Machines' BC-series of 5-axis machining centres



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British machine tool industry talisman in rude health; new UK firm offers CNC multi-slide auto tech; artificial intelligence for CNC machine process control & CMM probe path planning; Dah Lih for Ward Hi-Tech; Gate gets into CNC-supported manual tech

september 1995

We kick off the month celebrating a return to form for the machine tool industry, following a long international recession, with The 600 Group our focus. Its story is one of business rationalisation of its business and reduced costs – meaning the sale of its Startrite business and a more than halving of its employee headcount, from 2,800 to 1,300. But the group is still a British machine tool industry talisman, the largest publicly quoted such company and one of the top rank of machine tool companies in the UK, measured by turnover. It has introduced new products in previous years, including the manual/CNC combination style lathe that is currently popular, so the company is expanding its Mitsui Seiki FMS system for the manufacture of parts at its Heckmondwike, West Yorkshire, main plant. With a share price of more than 120p, long gone are the days when that figure was 30p, we highlight.

Our comment in the second issue of the month celebrates an addition to the UK machine tool industry, a not too familiar event. The company is Swiftlevel, the founder is Philip Wilkinson, who has returned to a previous area of interest – CNC multi-slide automatics. He set up Winchester machine tools around 1988 to do the same thing, but that company's products passed to BSA Tools, which at this time is still making them. Swiftlevel's product is SuperSwift. It is aimed at the up-to-22 mm bar diameter, Brown & Sharpe 00B and CVA 8 area, and is priced at £38,000 (£76,000 today). Production rate will be one a month for 1995, then two a month in 1996, with three a month the following year. A cautious approach is being taken so as not to repeat the mistakes of his Winchester experience, but we suggest if larger competitors see unsatisfied demand here, they will not hesitate to join the party.

In news, we continue the machine tool flavour with a report on the regular MATADOR conference, which is concerned with machine tool design. Multi-role or modular machine design is under the spotlight, with these intended to cope with frequent changes of product or process. Artificial Intelligence (AI) is also getting a look in, with an AI system for estimating and

compensating for process errors in CNC machines plus an AI probe path planning system for multi-task CMM inspection.

Elsewhere, Ward Hi-Tech says it is now the UK agent for Dah Lih, a Taiwanese maker of, at that time, vertical machining centres. The association between the firms continues today. Gate Machinery International has joined the current vogue, adding a turning-only lathe that boasts both CNC-supported manual use and CNC automatic application. It is priced at £30,000 (£60,000 today). The company will fit the same CNC to one of its turret mills and also offers it as a retrofit for manual lathes and turret mills. Also treading the CNC retrofit path for turret mills is Acu-Rite, and once again this development supports intermediate CNC-assisted manual operation, plus 2-axis CNC contouring. A retrofit of a different kind is being offered by Ajax Machine Tools, a belt-head that adds tube or roll-grinding capability to any lathe.

In cutting tool news, specialists Microbore Tooling Systems and Sumitomo Electric Hardmetal partner, with the latter's inserts used in a new range of the former's cartridges, while Dormer has launched a series of technical machining guides for all major material classifications. The company has created its Application Material Group (AMG), developed to make tool selection easier by linking the correct cutting tool to the material being cut.

A partnership between two UK companies sees T Bowers & Co (Toolmakers) gain global sales and service rights for Magneti Systems' magnetic chucking products. Confidence is underpinned by an analysis of competing products, with the Magneti Systems' products coming out on top.

In feature articles this month we have: centreless grinding, taking in Sweden's Lidköping, plus case studies; British Aerospace replaces computer system for scheduling with a manual system; preventative maintenance service; a Tooling '95 preview; automated video measurement technology in action; inverted spindle, or self-loading VTLs; and an investigation into subcontracting/customer partnerships as part of one of our regular subcontracting supplements. ■

Key Events
sep 95

The BBC begins regular Digital Audio Broadcasting, Crystal Palace transmitter



Boxer Frank Bruno wins the WBC world heavy-weight championship, beats Oliver McCall

Sony enters the video game market with the release of its PlayStation



BBC One premieres Jane Austen's 'Pride and Prejudice', starring Jennifer Ehle and Colin Firth



Sam McCluskie, trade unionist, dies at 63



Hewlett Packard: the first sub \$1,000 recordable CD disc drive

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