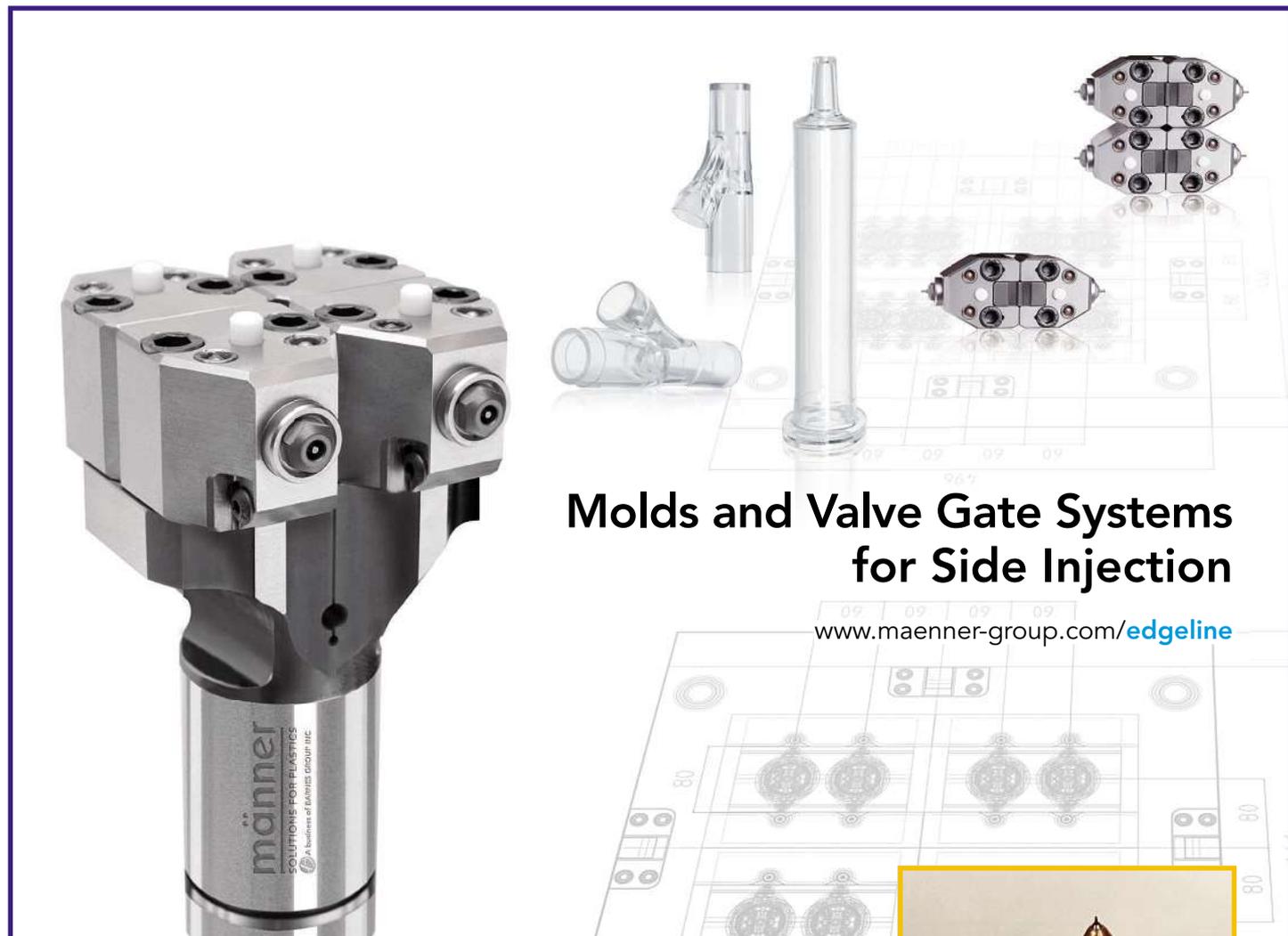


The trade magazine for tool, mould & die making

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Molds and Valve Gate Systems for Side Injection

www.maenner-group.com/edgeline

Additive manufacturing



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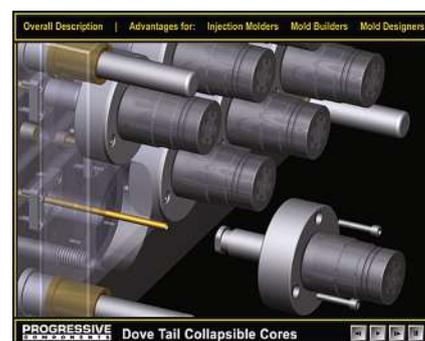
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AM, 3D printing boom continues



The market for additive manufacturing (AM), consisting of all AM products and services worldwide, grew at a compound annual growth rate (CAGR) of 35.2% to \$4.1bn in 2014, according to the recently published Wohlers Report 2015. The report states that the industry expanded by more than \$1bn in 2014, with 49

manufacturers producing and selling industrial-grade AM machines. Quite amazing, considering the AM industry represented a mere \$295m in 1995.

Wohlers Associates reports that growth occurred in all segments of the diverse industry, including the low-cost "desktop" 3D printer segment and industrial metal AM systems for demanding production applications.

However, producing functional additive parts is not as easy as just hitting "print". Just as CNC machining has inputs affecting success (such as cutter selection, feed rate and the rigidity of the workholding), additive manufacturing has comparable inputs that affect its success – inputs that the user of additive manufacturing learns to apply over time. Describing these inputs helps to paint a more realistic picture of what it's like to apply additive manufacturing in production. Our article on page 30 highlights some of the factors that the user of additive manufacturing has learned to consider.

On another front, after visiting Portugal's tool and mould makers earlier this year we went to Poland last month to find out what's happening in the mould making and injection moulding sector and how companies implement the latest technology to remain competitive (p.26).

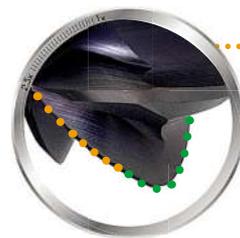
Demand for plastics and related equipment is on the rise in Poland, so the prospects for the 19th Plastpol exhibition, Poland's international plastics showcase (26 to 29 May, Kielce), look promising (p.24).

Barbara Schulz
EDITOR-IN-CHIEF

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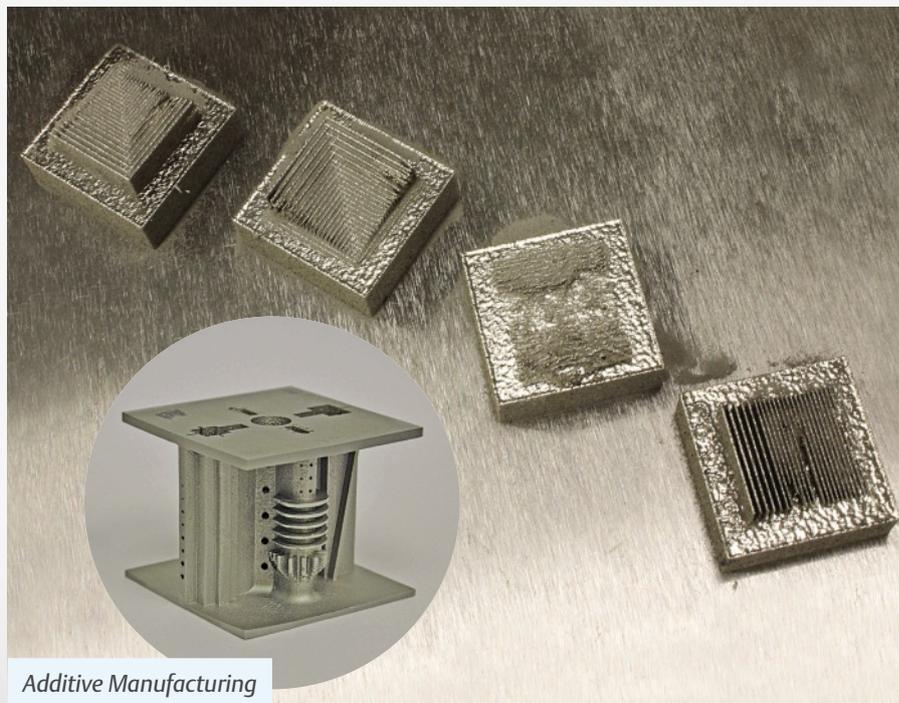
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Additive Manufacturing

Source: Gardner

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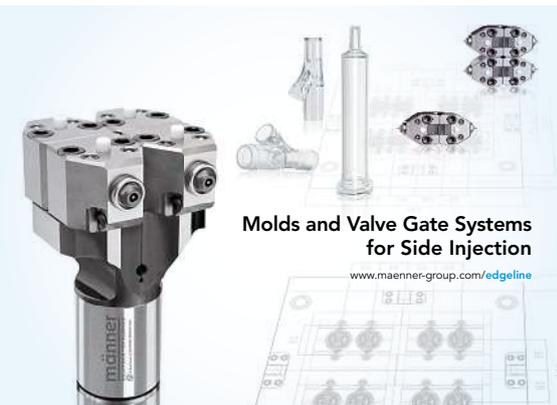
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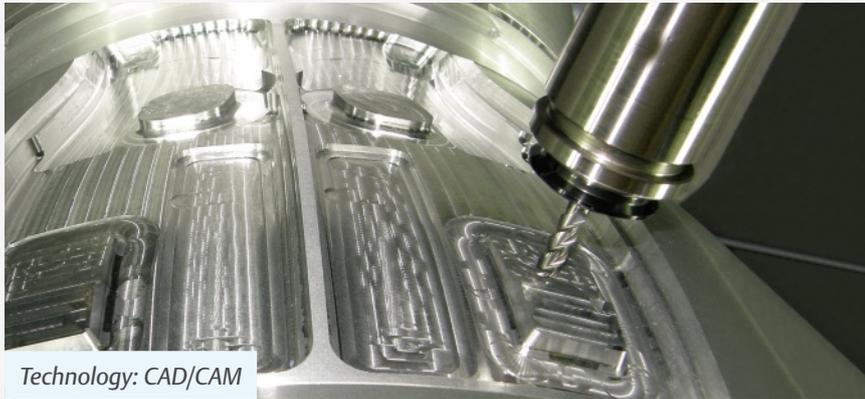


Molds and Valve Gate Systems for Side Injection

www.maenner-group.com/edgeline

Source: Manner

Cover photo courtesy of Manner.



Technology: CAD/CAM

Source: Open Mind



Show Preview

Source: Targi Kielce

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NEWS IN BRIEF

Aweba expands into North American market

Germany-based Aweba Werkzeugbau opens a new subsidiary in Dublin, US. The company specialises in complete toolmaking solutions for the automotive industry and is now moving close to its growing customer base in the US, the company said.

Stratasys appoints new Chief Business Officer

Stratasys has appointed Joshua Claman as Chief Business Officer (CBO). In this newly created role, Claman will be particularly focused on driving commercial and go-to-market synergies across the company's different business units, the company said.

Gear industry gathered in Sandviken, Sweden

Sandvik Coromant successfully hosted the first Gear Summit from 16 to 19 March in Sandviken, Sweden. Twenty-five decision-makers and experts from the gear industry discussed the common challenges and the future of gear manufacturing to improve their industry.

AMT elects new board of directors, officers

The US-based Association For Manufacturing Technology has elected its 2015-2016 officers and directors. The AMT Board of Directors named Jerry Rex, executive vice president, Concept Machine Tool, Plymouth, US, to serve as chairman.

German laser industry on road to success

According to the German Engineering Federation VDMA, in 2014 association members produced about EUR 852m of laser-based machines, corresponding to an 11% growth compared to 2013.

Plastics showcase sets records for exhibitor numbers, international participation



According to the organiser, the Plastics Industry Trade Association, SPI, NPE 2015 was the largest show in NPE history.

United States - The crowds of attendees and the clamour of working equipment that filled the giant exhibit halls at NPE 2015 told the story better than numbers, but now there are statistics to make it official: NPE 2015 was the largest show in NPE history, organiser SPI (the Plastics Industry Trade Association) said. The International Plastics Showcase has released final data for the last event, which took place from 23 to 27 March 2015 in Orlando, Florida. The data shows NPE 2015 attracted

2,029 exhibitors over net 104,813 m² of exhibit space - exceeding the previous records of 2,009 exhibitors in 2000.

In addition, registered attendance for NPE 2015 was 65,810, 19% greater than three years ago, the organisers announced. These registrants came from 23,396 unique companies, 22% more than the 19,198 companies at NPE 2014, representing a substantial increase in buying potential, the American Industry Association said. It added that in-

ternational participation also set new NPE records. Nearly 44% of exhibiting companies and 26% of registrants came from outside the US. Nearly 5,000 registrants were from Latin America.

"What made NPE2015 a milestone in the 69-year history of NPE was not only its size and international diversity, but also the richness of its offerings to attendees," said SPI president and CEO William R. Carteaux. "The wealth of content surpassed our previous shows and provides a guideline for making future NPEs even more attractive to participants."

Exhibitors came from 37 nations in all. In descending order of number of exhibitors, the ten largest participating countries were China, Taiwan, Canada, Italy, Germany, India, Turkey, France, Switzerland, and South Korea. These figures don't include many companies based abroad but which exhibited through their US subsidiaries, SPI said.

» **NPE 2015,**
Orlando, USA. npe.org

UK economic growth holds steady, slowing manufacturing sector

UK - According to the CBI's latest Growth Indicator, UK economic growth held steady in the three months to March and is expected to gather momentum over the next quarter. While it shows stronger growth in the distribution (retail, wholesale and motor trades) and consumer services sectors in March, compared with the previous month. Manufacturing reportedly showed weaker performance, with 11

of the 18 sub-sectors reported slowing growth since February, as well as in business services where firms have been feeling the effect of stronger competition. According to CBI Deputy Director General, Katja Hall, there are prospects of more growth to come although a strong pound is weighing down export growth.

» **CBI, London, UK.**
cbi.org.uk



Katja Hall, CBI Deputy Director General: "The outlook for 2015 looks encouraging."

Precision tools manufacturer appoints new CEO of its operations in the US

Germany/United States - Mapal has appointed Torsten Buchwald as new CEO and president of its two branch offices in Huron, Michigan and Fountain Inn, South Carolina, US. The two offices together employ about 175 employees with a focus on

PCD and carbide tools, the company said. According to Mapal, there is strong demand from the aerospace and automotive industries. "We would like to make use of the strong growth potential of these industries and further expand project busi-

ness," said Buchwald. He has set clear goals: "We intend to boost sales of Mapal USA significantly in the coming years."

» **Mapal,**
Aalen, Germany.
mapal.com



Source: Mapal

Torsten Buchwald is CEO of Mapal in the US.

German Rep-Rap names first US reseller

Germany/United States - German Rep-Rap has named Florida-based 3D-Chimera as authorised reseller for the company's 3D printers in the US. 3D-Chimera is German Rep-Rap's first value-added reseller in the US.

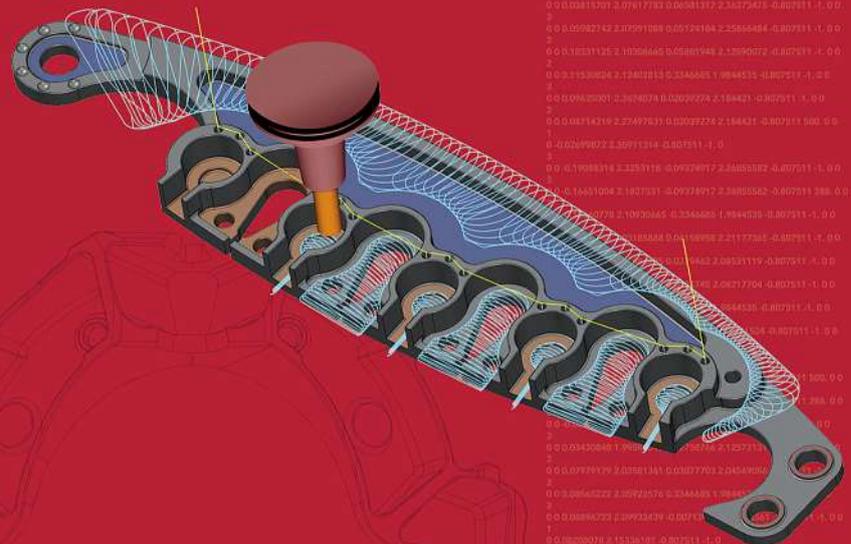
"We already have a number of customers there that have received our products from Germany," said Florian Bautz, managing director of German Rep-Rap. "With 3D-Chimera, our existing and prospective customers now have a local contact as well. We are confident this will further increase our market share for 3D printers."

3D-Chimera is offering the full German Rep-Rap product line. The company said it anticipates accelerated adoption by the manufacturing and education market segments.

3D-Chimera has been involved in the 3D printing industry from day one, Rep-Rap said, and has accumulated extensive experience with the installation and operation of 3D printers, as well as CAD and engineering know-how.

» **German Rep-Rap,**
Feldkirchen, Germany.
germanreprap.com

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Joke celebrates 75th anniversary



Source: Manfred Esser

Germany - Bergisch Gladbach-based Joke Surface Technology turns 75 this year. What started as a small repair shop in 1940 has grown to become a specialist in surface treatment and related services for the tool and mould making industry. MD Udo Fielenbach: "We are more than a mail-order business."

Machine tool makers' sights firmly set on South Korea



Source: VDW

VDW's delegation from Germany used the opportunity to tour Doosan Infracore's plant in Seoul Incheon, where construction machinery and engines are produced.

South Korea - Following a successful first event in 2012, 23 German manufacturers of machine tools were once again showcasing their products, solutions and services at the Technology Symposium hosted by the VDW (German Machine Tool Builders' Association) in Seoul on 17 and 18 March 2015. The past two years were boom years for South Korea. In 2014, machine tool consumption rose by 5% to reach €3.6bn, VDW says. For 2015 and 2016, Oxford Economics expects growth rates

of almost 10%. According to Barbara Zollmann, executive director of the German-Korean Chamber of Industry and Commerce, the South Korean machine tool industry has to transform itself to compete. "This is conditional upon capital investment and innovations. German machine tool manufacturers can support South Korean firms in this process, and help them to obtain competitive advantages."

» **VDW**, Frankfurt, Germany. vdw.de

Euromold announces hall concept, names exhibitors



Source: Schulz

"Euromold 2015 exceeds our expectations significantly, which makes us as organisers very happy," said Diana Schnabel, Demat managing director.

Germany - After Euromold's move to Düsseldorf (22 - 25 September 2015), organiser Demat has now named specific exhibitors already registered. Among these are long-standing Euromold exhibitors such as Meusburger, Hasco, Knarr, Voxeljet, Keyence and Werth Messtechnik, Demat said. But there was also a range of new exhibitors. "Apart from our long-time exhibitors, which remain loyal to us in great numbers - also in regards to the move to Düsseldorf - we find many new exhibitors as well, especially from the additive manufacturing and 3D printing industry with their booming and dynamic exhibitors from Asia and the United States," Demat managing director Diana Schnabel said. She emphasised the new hall layout, which will connect the different Euromold areas much better than in the past. For instance, exhibitors from the 3D printing industry will be under the same roof as mould and toolmakers, machinery suppliers or service providers.

Schnabel is also confident that Euromold's strategic partnerships with Terry

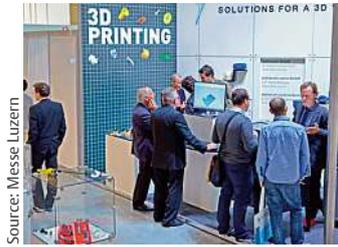
Wohlers and the US-based Society of Manufacturing Engineers SME will strengthen the show and the topic of additive manufacturing. "Specifically important is the fact that SME organises 'Rapid' the worldwide biggest and most important congress in its field," she said. During Euromold, SME will organise a similar event, Schnabel added.

According to Demat, the following companies have already booked a stand among others: AHP Merkle, Aicon, Alicona, Alphacam, AMF Meier, Artec, Belotti, Böllinger Group, Cold Jet, Cronitex, DSM Somos, Envisiontec, Faro, Hasco Hasenclever, Igus, imes-icore, Isel Germany, Lucchini, MK Technology, Tool- and Patternmaking Association, Nabertherm, Nilfisk Poldi, Prodways, Rainer Knarr, Ringler, Roemheld, Schneider Prototyping, Schott Systeme, SGM Schut, Smart Optics, Speedpart, Stäubli, THK, VG Kunststofftechnik, VHF camufacture, Voxeljet and Werth Messtechnik.

» **Euromold 2015**, Düsseldorf, Germany. euromold.com

Swiss show organiser launches additive manufacturing expo

Switzerland - Messe Luzern (Lucerne Exhibition Centre) announced the launch of AM Expo, the international trade fair for additive manufacturing, to be held on 20 and 21 September 2016. According to the organiser, the fair will focus on the fast-growing series production market, which has progressed well beyond the stage of prototype production. To help manufacturers master the challenges of series production, AM Expo will have machine manufacturers and contractors (service providers) at the fair to show exactly what can be done, and which technologies function reliably, Messe Luzern explained. AM Expo is aimed at the medical technology, industry, mobility,



The 2016 AM Expo is sponsored by swiss-3D-printing and organised by Messe Luzern.

electronics and micro-technology markets. Developers and engineers in these sectors will find AM Expo a useful source of information, the organiser said.

AM Expo is to be launched at a kick-off event on 24 June 2015.

» **Messe Luzern,**
Lucerne, Switzerland.
am-expo.ch

Software developer appoints new president

United States - Meghan Summers-West has been appointed president of CNC Software, the developer of Mastercam CAD/CAM programming software for CNC machine tools. "As many people close to the Summers

family know, this transition has been almost 32 years in the making," former president, now chairman, Mark Summers said. "My daughter Meghan was born the same year that my brothers and I officially launched Mastercam and established CNC Software in 1983." Summers also said that with the rapid consolidation of many CAD/CAM companies, this decision represents a continuation of CNC Software's deep, personal dedication to Mastercam. He emphasised that appointing Meghan, who holds a BSc degree and MBA, also demonstrates that the company remains a private entity.



» **CNC Software, Tolland, USA.**
mastercam.com

Source: APRO

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Manufacturer of metal additive manufacturing (AM) systems relocates to new site



Source: Schulz

Renishaw has relocated its AMPD division to a larger site in Stone, UK.

UK - To help nurture sustained business growth, the Additive Manufacturing Products Division (AMPD) of global engineering company Renishaw has relocated to a larger, state-of-the-art site in Stone, Staffordshire, in March. The new facility is on Brooms Road, Stone Business Park, UK.

According to Renishaw, the move reflects the expansion of the additive manufacturing industry sector

around the world, as well as Renishaw's commitment to the technology. Renishaw claims to be UK's only manufacturer of metal additive manufacturing (AM) systems and employs over 3,800 employees in its 70 offices across 32 countries.

"The new Renishaw site in Stone is about more than just additive manufacturing. It will showcase the company's industry expertise in fields including industrial

metrology, spatial laser measurement and additive manufacturing," explained Robin Weston, marketing manager of Renishaw's Additive Manufacturing Products Division. The site will incorporate a network of global additive manufacturing solutions centres where companies can trial Renishaw's AM systems.

» **Renishaw**, New Mills, UK. renishaw.com

International metalworking exhibition now open for registration

Germany - The 19th international exhibition for metalworking technologies, Metav 2016, is now open for registration. Held from 23 to 27 February 2016 in Düsseldorf, Germany, organiser VDW (German Machine Tool Builders' Association) has recently integrated new permanent features into its show. The new dedicated areas for additive manufacturing, moulding, quality and medical technologies are

said to offer exhibitors and visitors new, attractive topics themed around the value creation chain in the capital goods industry.

"All four topics intermesh superlatively with Metav's agenda that's so familiar to our customers. We are confident that they will attract many established and new visitor groups," VDW Executive Director Dr. Wilfried Schäfer said. To render this change visible to everyone,

the existing nomenclature has been expanded by more than 300 products in the search term listing. This means that Metav now covers a portfolio of almost 1,100 products. "The expansion is an attractive step for exhibitors and visitors alike, offering substantial synergy effects," Schäfer said.

» **Metav 2016**, Düsseldorf, Germany. metav.de



Source: Schulz

Dr. Wilfried Schäfer, executive director of VDW: "We are aiming to offer both exhibitors and visitors new, attractive topics."

Japanese machine tool builder expands European parts centre, production capacities



Source: Mazak

Honoured guests perform the official ribbon-cutting ceremony at the opening of Mazak's European Parts Centre in Belgium.

Belgium - Yamazaki Mazak has officially opened its newly expanded European parts centre in Leuven, Belgium, and has announced further investments to strengthen its manufacturing and customer support across the region. The Parts Centre was officially opened by Takashi Yamazaki, vice-president of Yamazaki Mazak Corporation, along with Marcus Burton, European group managing direc-

tor. Mazak has also started construction of its new Technology Centre in Hungary, and from 2016 the European manufacturing plant in Worcester, UK, will benefit from £6m of new machining capacity, the company announced. Mazak said these measures will help to expand the range of its European-built machines.

» **Yamazaki Mazak**, Leuven, Belgium. mazak.eu

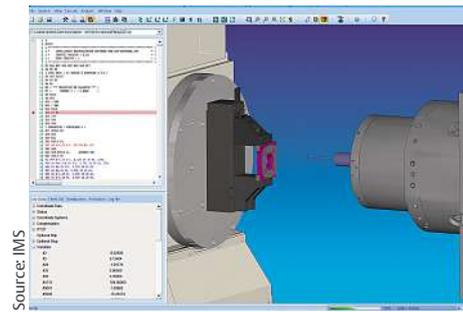
Software companies partner in UK, South Africa to complement service offerings

UK/United States - US-based IMS Software has announced the signing of a reseller agreement with Intrinsys of Milton Keynes, UK. Intrinsys will represent IMS in the UK and South Africa, carrying the full IMS product line including IMSpost,

IMSverify and IMSce. "IMS Software is an ideal fit for our robust manufacturing offering," Darren Cairns, director of Intrinsys, said. "Our new partners at IMS will help us to complete our offering, enabling even greater success for our cus-

tomers in the future." Dan Wrenn, president of IMS, added: "We're delighted to have Intrinsys as a key partner in our expanding UK and South Africa presence."

» **IMS Software, Haverhill, USA.** ims-software.com



IMS and Intrinsys products complement each other perfectly, IMS said.

Italian AM association established

Italy - A few months from its start-up and after only three operative months, Aita, the Italian Association of Additive Technologies, presents itself as a reference entity for the Italian industrial sectors of additive technologies and 3D printing. GM Alfredo Mariotti said that "the additive technologies sector represents a key factor for the growing-up of the Italian mechanical manufacturing industry."

On the occasion of its General Assembly and Board of Directors meetings (both held on 31 March), the association reportedly reached and surpassed its target of 50 members, creating a transversal entity grouping machine manufacturers/dealers, design software companies, service centres, big companies and SMEs using additive technologies in manufacturing. Universities and research centres make up the "knowledge and innovation tank". The members' list is completed by some individuals, aiming at increasing their cultural level on the topic, the association said.

» **Aita, Milan, Italy.** aita3d.it



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Full house at the annual gathering for punching toolmakers in Austria

Austria - On 18 and 19 March 2015, Meusburger, the Austrian supplier of standard parts, organised a "Gathering of Punching Toolmakers" at its headquarters in Wolfurt, Austria. The participants of the fully booked event were offered interesting news from the industry and had an opportunity for socialising and for exchanging practical knowledge. In addition, the guests were able to take a look behind the scenes.

Following a short welcoming speech, Gerhard Krammel, product manager at Meusburger, held an appealing lecture about "Tool design and guiding systems - the basis for success." During the subsequent two-hour tour of the production halls



Meusburger's traditional customer events with a focus on certain industry sectors attract a lot of interest from industry professionals.

and warehouse, Meusburger provided an exclusive insight into its manufacturing processes and answered all questions posed by the visitors. During the lunch break on the sunny terrace, the

guests were offered some culinary delights and the opportunity to share information with the other attendees. In the afternoon, they heard some more, interesting lectures about a range of

topics related to punching tool construction: Jürgen Jung, employed at Jung-Lean-Engineering, talked about "The reduction of set-up times - A symbiosis of methods and techniques", and Axel Wittig, from Webo Werkzeugbau Oberschwaben, presented "Toolmaking meets lean production - synchronised manufacturing with batch size one". After another break, Walter Ottendorfer held a lecture on "3D design and NC programming of cutting, punching and progressive dies" before the official part of the event reached its end at about 4 pm.

» **Meusburger,**
Wolfurt, Germany.
meusburger.com

Toolmaker celebrates 25-year partnership with Delcam



Elkington Brothers uses Power-Mill to produce tooling up to 25 tons in weight.

UK - Birmingham-based toolmaker Elkington Brothers has completed 25 years as a customer for Delcam's CAD/CAM software. The company installed its first system in 1989, having used traditional methods for the

first fifty years following its founding in 1939.

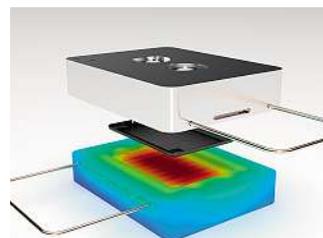
"It was a big decision to move to computerised methods as the software alone cost tens of thousands of pounds and the computers and CNC machines were also much more expensive than they are now," remembered Elkington Brothers' managing director, James Kelly. "Subsequent years have proved it was the right decision. I'm certain that, if we hadn't invested in CAD/CAM systems, we wouldn't be here now."

Today, Elkington Brothers has seven staff working on the software.

» **Delcam,**
Birmingham, UK.
delcam.com

Tier 1 supplier implements rapid heating technology

France - Roctool, French specialist in the design and development of technologies for rapid moulding of composites and plastic injection, has just signed a licence agreement for automotive applications with US-based ABC Group, a world leader in the design and production of plastic automotive systems and components for OEMs worldwide.



Roctool induction heating calculation with Autodesk Moldflow.

According to the company, Roctool technologies offer high-speed heating capabilities and are applicable to injection and compression tooling. ABC Group is now working to identify innovative applications for the technology. "The induction heating technique developed by RocTool goes beyond the ability to quickly heat the mould; it is a way to achieve new manufacturing methods, develop cost effective material solutions and extend design possibilities for many applications," said ABC Group's David Boucard, director of advanced product development.

» **Roctool,**
Le Bourget du Lac, France.
roctool.com

Clamping technology provider opens new HQ in China



Source: Schunk

Hendrik A. Schunk and Dr. Simon Du (lion on the left and the right, respectively) handing the lions "Hong Bao" for good fortune.

China/Germany - Clamping technology and gripping systems supplier Schunk has recently opened its new China Headquarters in Shanghai. According to Managing Partner Hendrik A. Schunk, the company plans to push investments to expand its presence in China.

Schunk has been represented in China with its own subsidiary since 2003, and has since been growing, the supplier said. Schunk called the new headquarters an important milestone in the 70-years history of the fami-

ly-owned company. The new location offers more room for staff, is closer to the customer and provides more know-how transfer through the new Schunk Tech Center, Schunk said. A long-term goal was to strengthen and expand the market leadership for clamping technology and gripping systems worldwide. China will be the company's third pillar alongside Europe, the US.

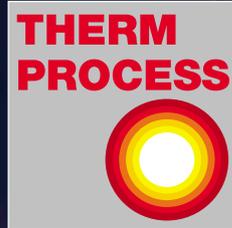
» **Schunk,**
Lauffen/Neckar, Germany.
schunk.com

Krallmann, IKV win innovation award



Source: Julia Althoff

Netzwerk Zenit e.V., Mülheim an der Ruhr, Germany, has honoured the Krallmann Group and IKV Aachen with its innovation award for the development of an integrated metal-plastics injection moulding process.



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Japanese cutting tool specialist signs licence agreement with Haimer

Japan/Germany - Japan-based OSG Corporation, a market leader for solid carbide end mills, and German tool holding technology provider Haimer have signed a strategic partnership and licensing agreement. As a licensed partner, OSG is now offering their cutting tool shanks with the patented pull out protection system Safe-Lock from Haimer.

OSG is headquartered in Toyokawa, south east from Tokyo, where it has its solid carbide end mill production, coating facilities and production facilities with the most modern CNC grinding machines.

Jiro Osawa, managing director of technology with the OSG headquarters in Japan and North American



Source: Haimer

Andreas Haimer, president of the Haimer Group, on the licensing agreement with OSG: "We are very proud and happy to have reached a strong partnership with OSG, one of the largest and leading producers of tools in the world."

CEO, is convinced of the system: "In addition to the absolute technical superiority of Safe-Lock compared to alternative systems, it is the only system that is actually in high demand globally

and also available in various clamping methods." He added that OSG's field testing proved that higher RPMs and feed rates even with difficult-to-machine materials can be achieved. Haimer's

Safe-Lock system is an integrated pull out protection for round cutting tools that uses a friction and form locking system. According to Haimer, the system increases process security and enables higher metal removal rates.

"We have established Safe-Lock as a standard in roughing and heavy machining for which a variety of tools are available worldwide," President Andreas Haimer explained. "We are very proud and happy to have reached a strong partnership with OSG, one of the largest and leading producers of tools in the world."

» **Haimer,**
Igenhausen, Germany.
haimer.de

European additive manufacturing conference



Source: Schulz

AM is identified as one of the major disrupting technologies of the 21st century.

Belgium - Cecimo, the European Association of the Machine Tool industries, is organising the first "Additive Manufacturing European Conference" at the European Parliament in Brussels, Belgium on 23 June 2015.

Here, representatives from additive manufacturing (AM) companies, EU institutions, think tanks and the machine tools sector will discuss how the full-scale industrialisation of AM could be achieved in a rapid and cost-effective manner, and how this disruptive technology could help create the highest value for the economy and society, Cecimo said. The event is hosted by Reinhard Bütikofer, Member of the European Parliament (Group of the Greens/European Free Alliance). For more information and to register: www.cecimo.eu/site/am-european-conference/.

» **Cecimo,** Brussels, Belgium.
cecimo.eu

Mould maker reports record sales, expects further growth

Germany - Zahoransky Formenbau, Freiburg, Germany, said that sales in both German plants grew by 20% last year. According to the company, the growth in sales can be ascribed to a rise in demand for injection moulding machines with integrated automation. Zahoransky's patented TIM moulds (Total Integrated manufacturing), TIM Light

and SCPS Flex are said to allow assembly work downstream from the injection moulding process to be carried out at the mould.

Furthermore, Zahoransky said that sales in India doubled, and following a strong demand for injection moulding machines, especially coming from globally operating enterprises, an independent branch was set up in the US on 1 January 2015 and split off from the previous agency.

For 2015, Zahoransky expects moderate growth in all plants, provided the global economy shows no signs of a slowdown.



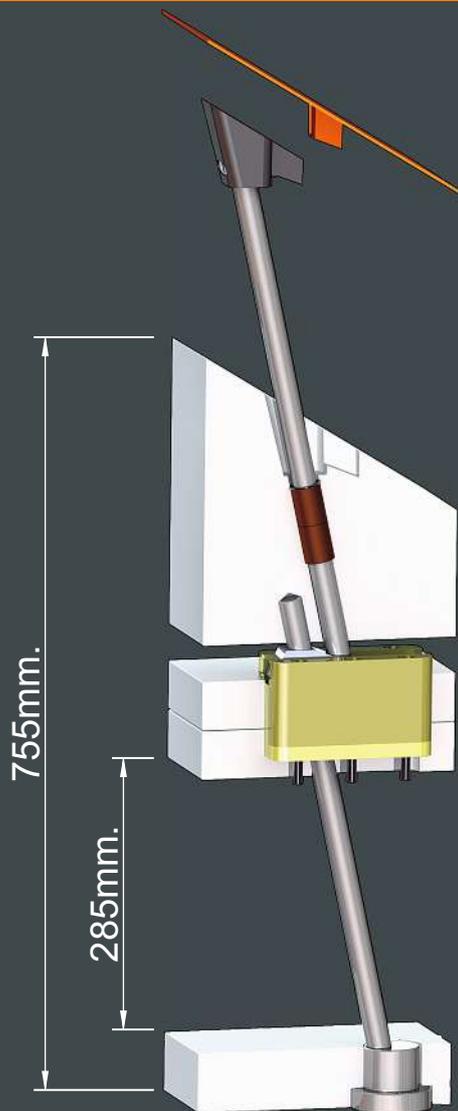
Source: Zahoransky

Zahoransky Formenbau's plant in Freiburg, Germany. Sales grew 20% in all German plants.

» **Zahoransky Formenbau,**
Freiburg, Germany.
zahoransky-group.com

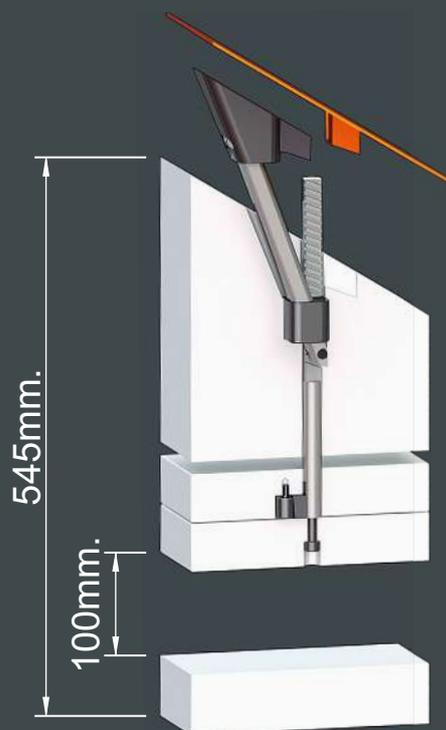
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View this amazing product in action!



Source: Manner

Manner's valve gate hot runner system.

Hot runners build on solid origins

Commercial hot runner systems have been available for over 40 years, and though the first design was patented in the US as long ago as 1940, the basic technique has not altered too much from the original. By Martin Courtney

Most hot runner systems continue to provide a conduit for a melt delivery system by extending the machine nozzle into the mould through the mould cavities whilst keeping the flow of the material hot.

Canadian pioneer Mold-Masters (acquired by Milacron for an estimated \$975m in 2013) offered its first hot runner systems in 1965, in what it claims was the first embedded heater surrounding the melt channel to achieve the uniformity of temperature required to maximise part quality. But it was not until the oil crisis in the 1970s that economic conditions

conspired to push technical innovation and adoption further as the rising price of raw materials forced mould and die makers to find new ways of reducing their own costs.

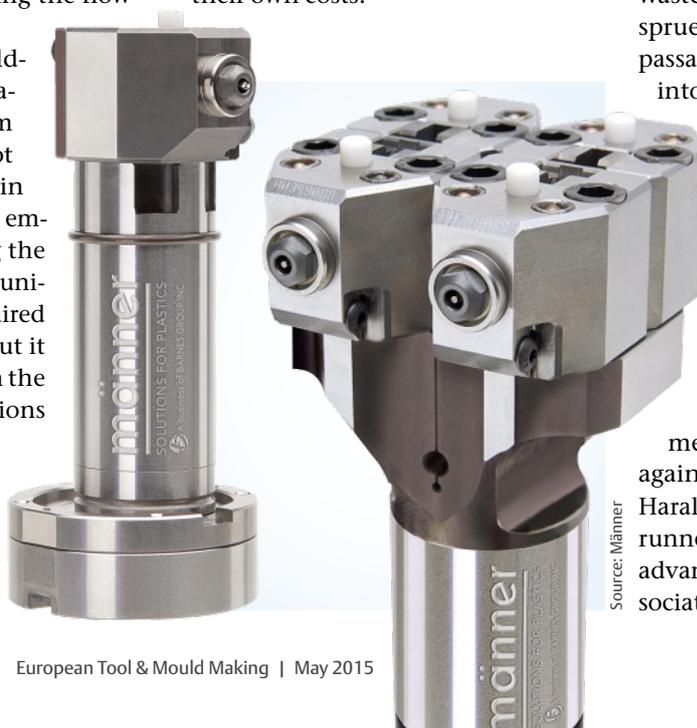
Necessity forces innovation

Hot runners helped to trim production expenses by minimising the amount of waste generated when cutting off the sprue, the solidified residue left in the passage which feeds the liquid material into the mould and which needs to be removed from the finished part.

The larger the mould, the bigger the sprue due to the distance between the injection cylinder nozzle and the mould cavity, whilst most manufacturers chose to recycle waste material rather than scrap it.

“One benefit is the material saving because you do not have to melt unnecessary material, cool it again and then regrind it,” explains Harald Schmidt, president at Mold Hot-runner Solutions (MHS), citing a second advantage of savings in energy costs associated with the sprue recycling - again

COC/COP side injection with valve gating: Manner's solution for the production of prefillable disposable syringes.



Source: Manner

a particular problem in the 1970s as electricity prices fluctuated during the oil crisis. Schmidt estimates that potential power savings for hot runners could reach as high as 25% compared to cold runners, for example.

“Not only do you have to plasticise the material that goes into a cold runner, but you have to extract that heat again through a cooling system. Once up to temperature and running 24/7 a hot runner usually comes in at 20-40% power consumption maximum, whereas with a cold runner mould you waste energy with every cycle,” he says.

Craig Reynolds is director of business development for hot runners and controllers at Canada-based injection moulding system specialist Husky which currently manufactures a range of hot runner systems, controllers and nozzles under the Altanium, Ultra, Unify and Pronto brands. He agrees that hot runners reduce wasted resin, lower the required fill pressure and improve the part quality which all contributes to a net reduction on the volume of scrap, whilst cutting electricity bills in as much as the need to re-process that same scrap is removed.

Mold-Master released its V-Series hot runners in the 1970s with similar systems introduced by Incoe and other manufacturers. What followed was a series of upgrades designed to deliver ever more precise temperature control through more accurate nozzles with the 1980s seeing new approaches to valve gating in particular.

New materials and better reliability

Reynolds says things advanced ‘pretty dramatically’ for hot runners in the 1980s as new materials with better

wear characteristics and/or thermal transfer properties have emerged, whilst improving reliability and hot runner lifecycles meant systems started to last longer between refurbishments.

“Next generation heaters have less variation in the manufacturing process and longer operating life,” he says. “Filling balance improvements have enabled fur-

ther cycle time reductions, which improve the payback of investing in a hot runner.”

“In the 1980s and 1990s you had thousands of new materials coming onto the market and conquering new market segments like packaging, medical and so on and hot runner systems had to complement this,” adds Schmidt. “Reliability has increased especially with valve

MHS hot runner system featuring the company's iVG internal valve gate nozzles for a back-to-back stack mould application.

Source: MHS



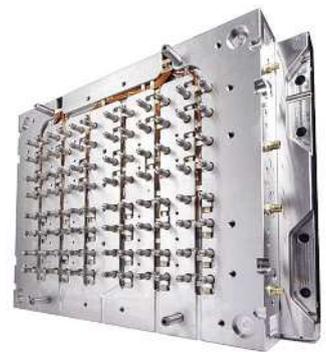
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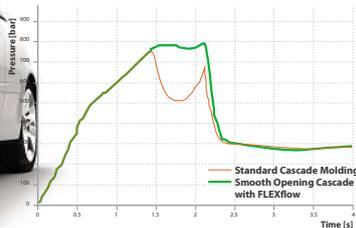
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gate systems which allow a wider processing window in a fully automated environment whilst process control is much more efficient.”

The introduction of front gating techniques helped to simplify mould design by eliminating parting lines but perhaps more significantly hastened greater automation of the process to improve productivity whilst offering greater flexibility in the size of the components which could be produced. Further innovation in side gating followed alongside new types of moulds - from stack moulds to family and cube moulds - which cannot be produced without using hot runner technology to deliver the required melt in many cases.

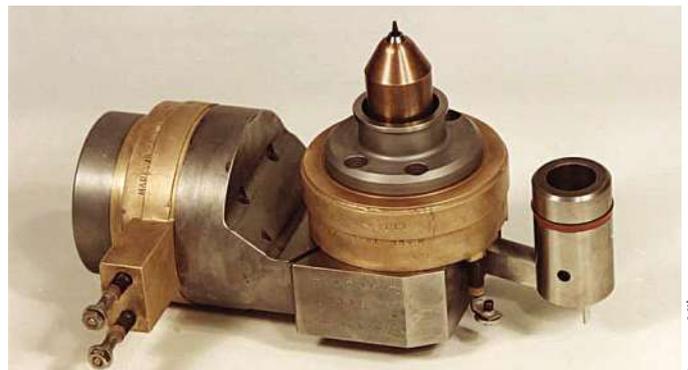
Männer first patented its cylindrical valve closure in 1981, for example, a component still used in hot runner systems today for the manufacture of tubular plastic parts, such as hyperdermic syringes, in the medical and pharmaceutical industries. Männer’s Edgeline hot runner was recently upgraded with a shut-off nozzle for lateral injection which allows for more accurate moulding using COC or COP plastics which also help to reduce waste and improve process reliability.

Current customer usage patterns

More recent innovation has centred on greater automation and temperature control through valve gate nozzles which help to control how quickly the melt in the gate area cools in order to increase precision and improve the quality of the component whilst cutting material wastage further by eliminating drooling or stringing for example. Hot runners are now used in almost every market segment, from automotive to consumer electronics, packaging and medical - typically employed by any firm making injection moulds or injection moulding parts.

Nevertheless, Reynolds believes that this type of system is still being used by less than half of the moulds being manufactured worldwide. This lack of penetration may stem partly from the belief amongst some moulders that hot runners cannot mould some heat-sensitive resins for very small part weights, despite Husky and others seeing hundreds of examples where companies are using hot runners for Polycarbonate parts smaller than 0.1 g.

“I think this perception is really a holdover from the early days of hot runners [but] with today’s hot runners, it’s definitely possible,” says Reynolds. “A hot runner is only as good as the temperature controller it’s connected to and this is some-



1965 copper alloy system: First embedded heater surrounding the melt channel revolutionises temperature uniformity for unmatched part quality.

Source: Wilacon



Source: Husky

Husky's Ultra Helix provides the possibility to direct gate parts with gate vestige so clean it is often unmeasurable, with a level of gate quality that lasts for millions of cycles, Husky claims.

times where moulders can be misled. Control is just as important as the nozzle and heater design."

Return on investment

Despite the obvious benefits the cost and complexity of buying, setting up and maintaining hot runner systems compared to cold runners continues to deter companies from making the investment. Others point to potential for thermal degradation of the material and difficulties in carrying out colour changes as remaining disadvantages. Some applications are heat sensitive, whilst there is a perception at least that hot runners are not well suited to moulds which use very small shot sizes. Some parts, or families of parts, are also best kept attached to the runner until they reach another downstream operation, whilst low scale production makes it difficult to justify the relatively high cost of capital equipment purchases.

"Hot runners may make the mould slightly more expensive to manufacture and run, but they allow savings by reducing plastic waste [especially with continuously increasing prices for all types of resins and additives] and the cycle time [because] there is no need to wait until the conventional runners freeze," says Milacron strategic manager of marketing for Europe, Michael Schiele.

"I suppose one could argue that if the mould will have a very short production run of less than 100,000 parts over its life it can be more difficult to justify the cost

of the hot runner, but in general, the benefits can be applicable to almost every application," says Reynolds.

Future of hot runners

If hot runner technology is to continue its development, vendors have to put a greater emphasis on reducing overheads through tighter integration with the mould and the machine, argues Reynolds, making sure that different pieces of equipment 'can talk to each other and optimise themselves'. Other suppliers also point to a growing use of IT for simulation and optimisation purposes.

"I think the first task is so practically simulate the process, then based on that simulation and analysis you are designing the hot runner to optimise the parts," says Schmidt. "It is not so much about building hot runners faster and in higher quantities but building them to make better parts and that cannot go on without the IT and software side of things."

March 2015 saw Milacron introduce its Smart-Mold, for example, a platform based on an integrated PC that connects with sensors in the hot runner itself to feedback data from strain gauges, thermocouples and accelerometers.

"There is an ongoing trend for more complexity – step, servo motors and a growing number of sensors integrated within hot runner equipment [the data from] which needs to be understood and managed, alongside increasing automation and monitoring for preventative maintenance," says Schiele. **ETMM**

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smart hot runner solutions

Plastics design and mould show celebrates ten years

The Plastics Design and Moulding Exhibition and Conference (PDM) returns to the Telford International Centre on 16 and 17 June 2015, where the event will celebrate its 10th anniversary as the UK's premier annual event for the plastics industry.

More than 100 exhibitors including major names from every part of the UK plastics community have already confirmed their presence at PDM. Ten years ago the show made its debut in Telford, where it remains today, with the continued support of the biggest names in plastics moulding and design and all the major trade associations.

Signs of a shift back to moulding in the UK

Among PDM's long-established exhibitor base are many reporting signs of a shift back to moulding in the UK. "The biggest change in the last ten years has been the reduction in the number of moulders in the UK," says Stuart Lovett, marketing manager of Rutland Plastics. "This has been the result of the recession and a large number of OEMs choosing to have their parts manufactured in China. However that has now turned full circle

with OEMs now looking to source in the UK again."

Founder-exhibitor Boy had direct experience of this shift at PDM 2014 when it took an order for a machine from a customer who had successfully competed to win business previously sourced from the Far East.

The growing 2015 exhibitor list, which includes many new exhibitors and overseas businesses keen to showcase their capabilities to the UK market, is another positive sign for the industry.

However, the market still remains highly competitive and pressure to reduce costs and drive productivity is greater than ever before.

Richard Hird, managing director of Premier Moulding Machinery says: "In the machinery market the competition is more intense today than it has ever been. We believe our constant innovation will help us to keep one step ahead of the competition."

About the Plastics Design and Moulding (PDM) expo 2015

PDM 2015 returns to the Telford International Centre on 16 - 17 June 2015 and will be co-located with Plastics Recycling Expo and, new for this year, the Plastics Packaging Show.

Supported by all the major associations, PDM is the only exhibition specifically aimed at the design and moulding aspects of the plastics industry.

- » **Where:** The International Centre, Telford, UK
- » **When:** Tuesday 16 June 2015, 10am - 5pm, Wednesday 17 June 2015; 10am - 4pm
- » **Registration:** pdmevent.com



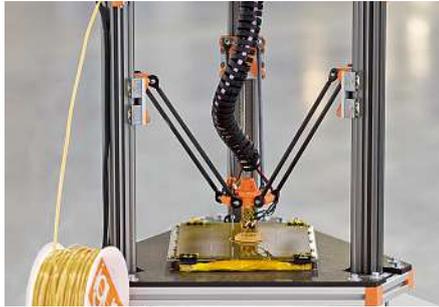
The growing 2015 exhibitor list, which includes many new exhibitors and overseas businesses keen to showcase their capabilities to the UK market, is a positive sign for the industry.

For masterbatch and additive producer Gabriel Chemie, collaboration is the key. "We work a lot smarter, we work more closely with our customers than we ever did before, adding value to their supply chains," explains managing director Philip Watkins.

The PDM conference runs on both days of the event and will cover the latest in plastics design and manufacture including moulding processes, rapid prototyping, materials innovation and sustainability issues. PDM15 is the perfect place for plastics and design professionals to network, learn and do business. Industry associations supporting PDM15 include the BPF, GTMA, as well as the PMMDA.

- » **PDM Exhibition,**
Telford, UK. pdmevent.com

World's first tribo-filament for 3D printers allows the creation of robust prototypes



Source: Iigus

Plastics specialist Iigus has developed a new tribo-polymer filament for 3D printers, developed specifically for engineers who wish to create structurally robust prototypes or small batch components for test in real-world applications or solutions, the company says. Suitable for use with any 3D printer that has a heated nozzle, print bed and uses ABS filaments, the material is said to be up to 50 times more resistant to wear and abrasion than products made from conventional 3D printer materials, such as ABS1 and PLA2.

"The flexibility of using a 3D printer for prototyping real usable components allows designers far more freedom in the creation of both intricate and simple shapes for workable parts used in motion applications, such as in bearing locations," says Rob Dumayne, director at Iigus. "All of our standard Iigus bearing products are available for download in STL format and can be used directly as input data for printing replacement parts."

Two different materials in two different diameters are available; Iglidur I170, which comes in yellow, has a better linear wear rate than I180, which comes in white. Iglidur I180 is more flexible than the stiffer Iglidur I170 and can therefore achieve a higher bending radius for faster printing speeds. Both printer filaments are available in diameters of 1.75 mm and 3.00 mm.

» **Iigus,**
Northampton, UK. igus.co.uk

Using AM technology to take two-wheeler design to new heights

Designers are continually thinking up new and lighter designs for their bike frames, and the MX6 by British bicycle design and manufacturing company Empire Cycles is using additive manufacturing technology to take two-wheeler design to new heights. The frame on show at the Renishaw stand during PDM is made of titanium in an AM250 laser melting machine.

According to Renishaw, Empire Cycles designed the mountain bike to take advantage of Renishaw's additive manufacturing technology, allowing them to create a titanium frame that would be both strong and light using topological optimisation - the new frame is some 33% lighter than the original.

Robin Weston, marketing manager Additive Manufacturing Products Division at Renishaw, explained at Euro-mold 2013 that Chris Williams approached Renishaw in the UK with the idea after experimenting with a pre-production 3D plastic model of his



Source: Schulz

MX6. "Chris is already a little bit of a pioneer, he recognised that additive manufacturing could be useful in bike design and I suppose his goal was really to make a much lighter bike." Chris started the Empire brand around six years ago, with the creation of the very unique AP1 downhill bike - this was his first head turner, being the first cast framed bike out there.

» **Renishaw,**
New Mills, UK.
renishaw.com

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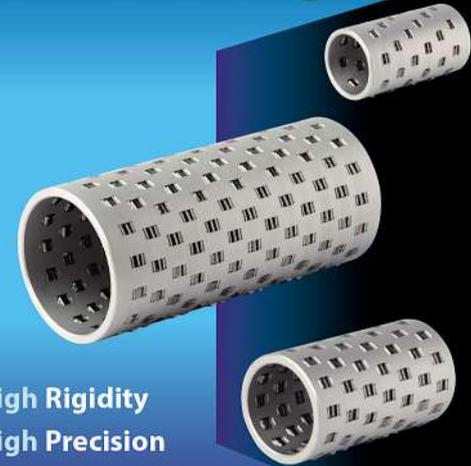
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Expanded range of ejectors, hot runner components



Source: Hasco

In the context of Hasco's new trade fair concept with a workshop character, the mould base and hot runner division will be displaying the latest innovations for mould and tool builders, the company says.

The comprehensive ejector range has been extended with the new stepped DLC-coated ejector pins Z443, featuring a stepped body diameter, Hasco says. The low friction values of the coated ejector pins are said to permit production without lubrication.

With the new Multimodule Z3281/... up to six Techni Shot 20 nozzles can be arranged in variable positions to allow reliable plastics processing, the supplier explains. Together with the single-part distributor, this is said to guarantee leak-free operation. The special modular design permits variable nozzle lengths and minimum cavity spacing within a small space, Hasco says.

» **Hasco Hasenclever**,
Lüdenscheid, Germany.
hasco.com

Drills eliminate the need for EDM drilling

Rainford Precision, UK, offers drills to machine hard steel up to 75HRC. According to the supplier, its Toglone range of hard drills from Iwata Tool eliminates the need for EDM drilling. The Toglone drills have been developed for cutting all types of materials from 40 to 75HRC, making them versatile whilst offering a hard machining capability that can comfortably cut tool steels and aerospace materi-

als such as Hardox 400 & 500 and Inconel X-750, the company says. The series is claimed to deliver a surface finish only replicated by reamers, whilst a hole tolerance of H7 is easily achievable with the correct set-up procedure. Tool life is also said to be beyond the realms of conventional tools.

» **Rainford Precision**,
Rainford, UK.
rainfordprecision.com

Pre-wired sequential shut-off hot runner systems

EMP pre-wired sequential hot runner systems combine the advantages of the two kinds of injection systems traditionally used, the "face-to-face" and "screwed-in" systems, bringing them to a higher performance level, the Italy-based exhibitor says. The nozzles are not screwed into the hot runner system but are integrated to the hot runner manifold through a device of screws and pins. This is said to ena-

ble the hot runner manifold to work optimally at no matter what working temperature, furthermore ensuring the anti-rotation of the nozzle itself. According to EMP, such a system avoids the annoying drawback of having to use longer nozzles as the manifold centre-to-centre distance increases.

» **EMP**,
Fabriano, Italy.
emp.it

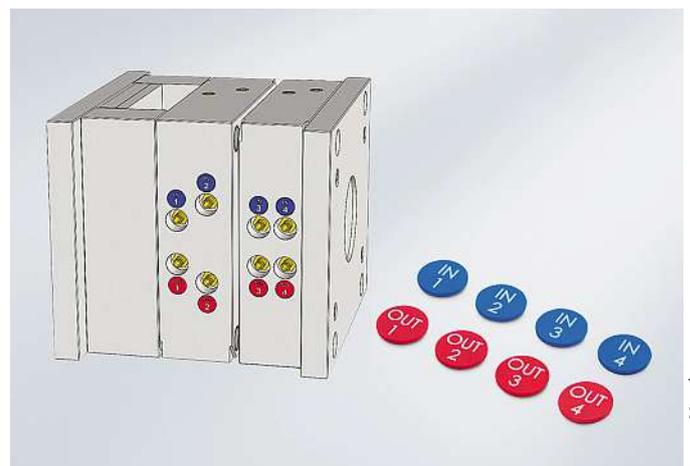
Time-saving and user-friendly marking system for cooling circuits

Meusburger now offers the E 2030 marking system for marking cooling circuits. The blue chips for the inlets are labelled with IN 1 - 24 and the red chips for the outlets with OUT 1 - 24. According to the company, the chips can be easily pressed into a circular pocket that will then be flushed with the surface. These chips can replace the engraving of letters with CNC machines, stamped numbers and let-

ters cut with an air grinder, thus saving time with a clear and user-friendly marking system, the company adds.

The chips are available in 15 and 18 mm diameters. To maximise the ease of use, the cooling circuit diagram can be printed onto the E 191xx labels, also available from the manufacturer.

» **Meusburger**,
Wolfurt, Austria.
meusburger.com

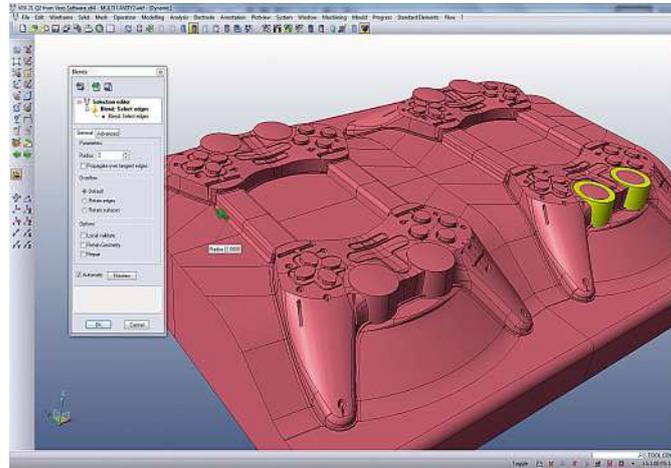


Source: Meusburger

CAD/CAM system includes more than 340 product enhancements, solutions for mould makers

Vero Software showcases Visi 21 with extensive enhancements at this year's PDM show. The company says that its updated CAD developments include a new process for managing multiple instances of the same geometry within an assembly. For example, multi-insert moulds and dies can now be managed with a single "master" part which will automatically update all references of the same geometry if any part modification is required, Vero explains.

Standard catalogue components will also be managed by the multi-instance technology. Vero adds that the release also includes motion study simulation tools



allowing the user to define timelines which control the movement for various groups of components. The physical interaction of model geometry can be detected and the results of complex

mechanisms simulated and investigated – ideal when validating the tool design and checking for potential collisions with slides, cams and lifters. Other CAD highlights are said to include Part

Revision Management, that now allows the management of model changes after they have been released to manufacture. A revision history is automatically created when a model has been released with the model geometry automatically locked. Any change to a released model will create a copy of the data and update the revision number, providing a history track and ensuring updated part manufacture.

Vero says Visi 21 is a re-release with significant CAM focus, including a new look to the CAM Navigator.

» **Vero Software,**
Cheltenham, UK.
verosoftware.com

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Swiss Steel, Emmenbrücke (Switzerland)

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Kielce to host 19th international plastics showcase

From 26 to 29 May 2015 business professionals from various sectors of the plastics and rubber processing industry will gather in Kielce, Poland, to view the latest innovations. Demand for plastics is on the rise in Poland, so the prospects for the 19th Plastpol look promising.

As European plastics production continued its positive trend (+1.5%) in 2014 as a continuation of its recovery since 2013, Plastpol 2015 organiser Targi Kielce is looking forward to hosting this year's show in Kielce, Poland.

European plastics industry continues its positive trend

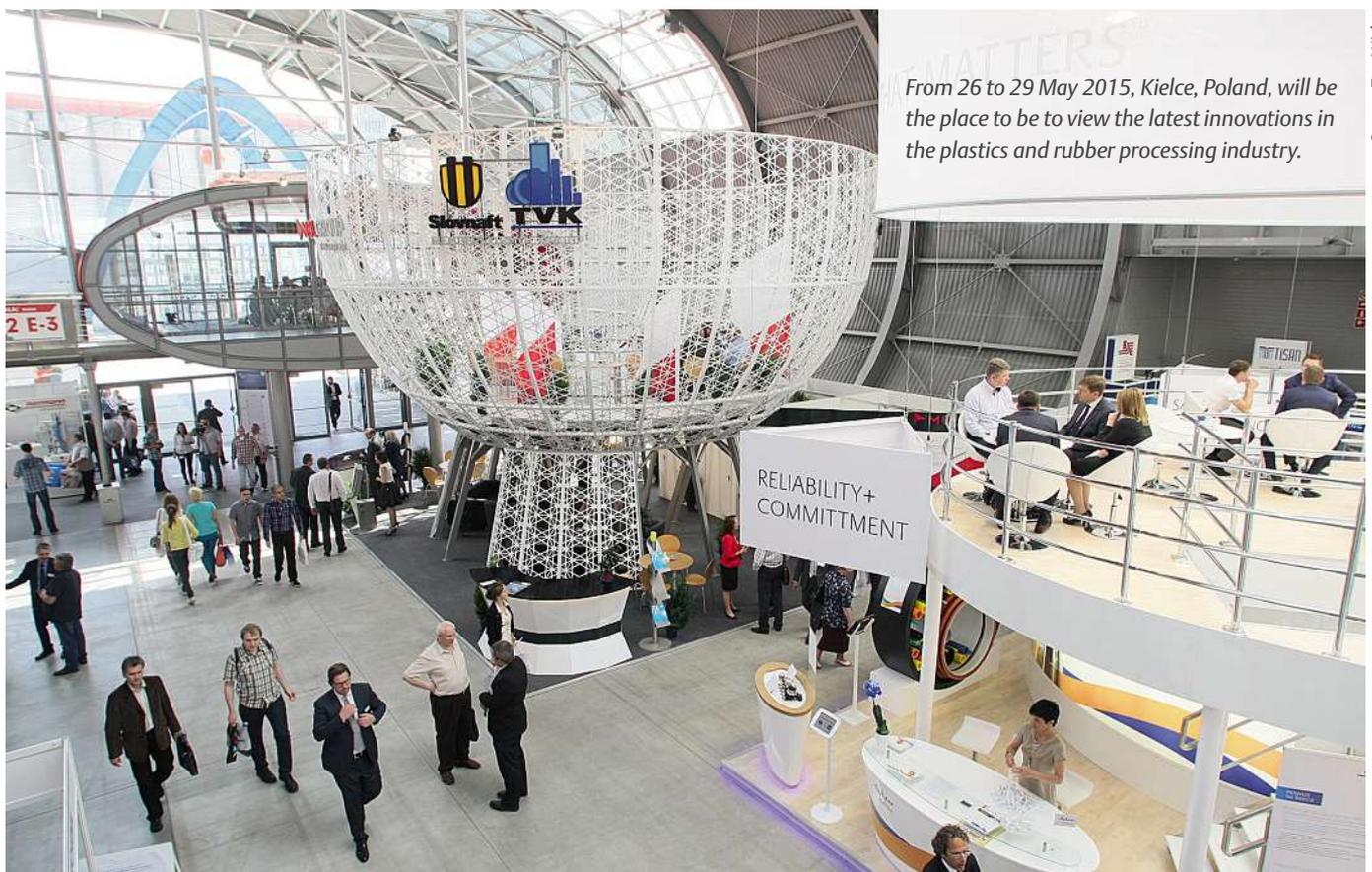
According to Plastics Europe (the Association of Plastics Manufacturers in Europe), the European plastics producers benefited from the recovery of its customers' industries such as automotive, electrical appliances and construction, gaining momentum in the second half of 2014. Still, European plastics production remains far from pre-crisis levels. This positive growth is expected to continue (+1%) in 2015.

"The plastics industry is a key contributor to the re-industrialisation of Europe due to its knock-on effect on other key areas of the economy," says Karl-H. Foerster, executive director, Plastics Europe. "This industry has a multiplier effect of almost 2.4 in the wider economy i.e. €100 GDP in the Italian plastics supply chain generates €238 of GDP in the national economy and for every job created in the plastics sector almost three additional jobs are created in the wider economy. Access to competitive energy and raw materials, support for innovation and training, investment in innovation as well as a consistent and complementary regulation will create the right conditions for our industry to continue to make a meaningful contribution to European economy and society at large", Foerster says.

Buoying demand for plastics in Poland

According to the association's data, in Poland demand for plastics increased by more than 3% in 2014 compared to the previous year, exceeding 2.9 million tons. In 2013, Poland was the sixth largest consumer of plastics in Europe, following Germany, Italy, France, the UK and Spain.

The business sector's optimism and dynamics have already been demonstrated by exhibitors at the last edition, the 18th International Fair of Plastics and Rubber Processing. According to the organisers, it is one of Europe's most important exhibitions of plastics processing. The trade show brought together 750 companies from 30 countries worldwide and reportedly attracted some



From 26 to 29 May 2015, Kielce, Poland, will be the place to be to view the latest innovations in the plastics and rubber processing industry.

17,000 visitors. In this part of Europe, Targi Kielce is the best place to see and become familiar with cutting edge technologies.

For the last show, the exhibition grounds had been modernised and expanded. For example, a new congress centre for 1,000 people, a multi-storey car park with 500 spaces, the west side entry terminal and improved access from the roads to Krakow, Warsaw and Lodz.

Showcasing machines, moulds for plastics processing

The exhibition stands will be the showcase for all kinds of machines and equipment used in the plastics processing industry, the organiser explained, citing tools and moulds for plastics processing along with the entire range of plastics and components, recycling technologies as well as IT systems that support production in addition to technological solutions and ready-made products. The expo will also feature complete process lines and manufacturing processes. The exhibition will be complemented by a program of seminars and conferences, the organiser says.

The 2015 expo will also include the sixth edition of Omniplast, a contest of plastic processing knowledge. The competition is for companies that take part in Plastpol as exhibitors. The event is aimed to disseminate and popularise knowledge of plastic processing and the related processing technologies.



Source: Targi Kielce

Last year's event brought together 750 companies from 30 countries and reportedly attracted some 17,000 visitors.

Last year's range of attending countries offered evidence of Plastpol's international flavour, according to organisers. It noted that the show played host to distribution and material companies as well as machine producers from Austria, England, France, Germany, Switzerland, Luxemburg, Belgium, Slovakia, Italy, Spain, Latvia, the Czech Republic, India, China, South Korea, Egypt, Taiwan, Israel, Denmark, Portugal, Greece, Hungary, Sweden, Ireland, the Netherlands, Japan, Slovenia, Turkey, the USA, Saudi Arabia, Qatar and of course Poland. The companies from Austria had their collective exhibition stand under the auspices of the Austrian embassy.

Brokerage event fosters networking among professionals

Similar to the past two events, the show will once again include brokerage meetings for sector companies. They are organised by the local centre of the European Commission's Enterprise Europe Network. According to the organisers, the brokerage event held on 27 May offers a great opportunity for companies to find potential business partners in Central Europe.

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Founded in 2006, C-Form has grown to 25 staff and complements the mould-making business with its own injection moulding company called C-Tech.

Source: Schulz

C-Form in brief

C-Form is a medium-sized mould-making business in Kowary, Poland, run by Martin and Paul Cyganik. The company manufactures small and medium-sized moulds for the Polish and other European markets.

- » **Founded:** 2006
- » **Annual turnover:** €1.5m
- » **No. of employees:** 25
- » **USP:** "Good marketing, quality products and fastest lead times."
- » **Contact:** www.cform.pl

Efficiency at maximum precision

Poland-based mould maker C-Form is relying on Meusburger's expertise in standard parts as well as the company's H-1000 clamping system, which helped C-Form to significantly minimise clamping times and increase machining precision. By Barbara Schulz



A typical mould realised by C-Form and Meusburger components.

Source: Schulz

Behind the inconspicuous walls of the former carpet factory lies the workshop of the young mould-making company C-Form, located just 100 km southwest of the city of Wroclaw in Poland. The firm, which was originally founded by Martin Cyganik, his brother Paul and father Jan Cyganik to provide moulds to the Swedish manufacturing industry, has grown into a successful business with customers in Sweden, Poland and other European countries.

In 2006, the two brothers took a risk and left Sweden – their home for more than 20 years – and ventured out on their own to provide the company their father was working for at the time, Ericsson, with superior injection moulds made in Poland. In the early years, the company's

products were manufactured on one milling machine, two EDMs and a grinding machine. Meanwhile, the company has grown to 25 staff and complements the mould-making business with its own injection moulding company called C-Tech. Together, the two firms have 55 employees under one roof, yet while the owners constantly fold their money back into the company, space is running out.

Paying a premium for advanced equipment pays off

Good marketing, quality products and the fastest lead times – that's been C-Form's mantra from the get-go. Its owners realised that the key to succeeding in the mould-making game was not only



The H-1000 guarantees short set-up times and precise repeat clamping without collision contours.



Since C-Form introduced the system last year, it has managed to reduce setup times by as much as 50%.

taking on the jobs they were offered, but also figuring out the processes and practices to make this a profitable business. Cyganik and his brother have no qualms about paying a premium for advanced equipment because they know the payoff comes in the long run in the form of shorter lead times and increased productivity. The strategy is working, as the company's customer list continues to grow.

Over the years, the brothers have purchased machines with the capacity to accommodate mould sizes of up to one ton. But good CNC equipment is only one piece of the puzzle. "From the beginning we have been working with Meusburger to make bigger moulds," Cyganik explains. "They make the clamping and cavity plates while we manufacture the

inserts and assemble the final moulds. It's been a very good relationship right from the beginning."

Clamping system ensures competitive edge

To remain competitive, effective fixturing and quick job change-overs are equally vital, because an idle machine doesn't make money. Reducing set-up time is a common goal regardless of the machining process – whether milling or EDM. As a consequence, C-Form relies on Meusburger's highly precise and innovative H-1000 clamping system, which gives the Polish company a competitive edge. According to Meusburger, the H-1000 guarantees short set-up times and precise repeat clamping without col-

lision contours – a system designed to save customers time and money.

Cyganik confirms the system's ability to facilitate set-up. "The H-1000 covers a variety of clamping situations on our milling machines as well as EDM die sinkers," he says. "Since we introduced the system last year, we managed to reduce our set-up times by as much as 50% and as a result reduce our lead times, making us even more competitive."

His machine operator, Mr Stachowiak, demonstrates the set-up and clamping procedure for an F-plate on the company's new milling machine; a procedure that has been reduced from 25 to only 5 minutes.

First, he removes the threaded plugs for the respective mould size and diagonally inserts four centring bodies. The

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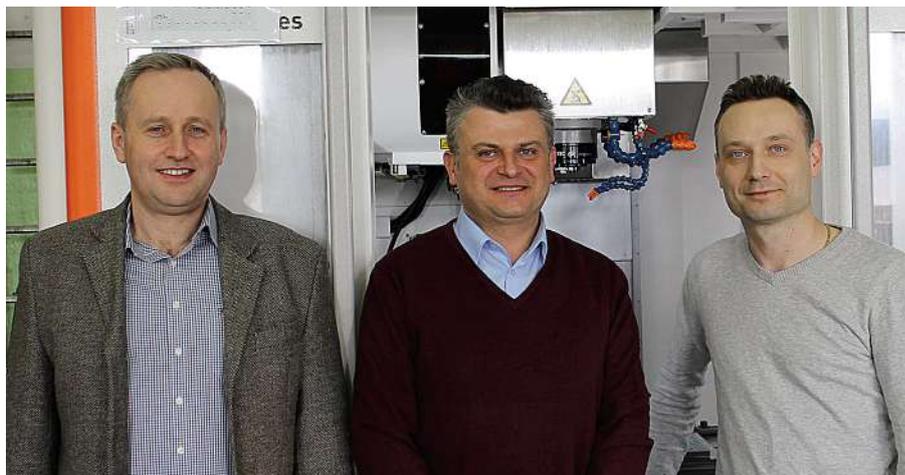
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Source: Schulz

Products made by C-Tech. In addition to the mould-making business, in-house injection moulding machines produce prototypes and end-use parts.



Source: Schulz

Meusburger Sales Manager Poland Grzegorz Natkowski, Meusburger Area Sales Manager Poland Gregor Dytko and C-Form's Martin Cyganik in front of the company's latest milling machine (left to right).

F-plate is placed above and clamped with expansion rings without any collision contours. Within minutes, the mould plate is positioned, clamped and ready for machining.

"Since the only protruding edges are the contours of the workpiece itself, machine programming is simplified and the risk of collisions minimised," Gregor Dytko, Meusburger Area Sales Manager Poland, explains.

"The split-line faces of the plates can be machined across the entire surface without meeting any obstacles. The system also makes it possible to repeatedly position plates within micron tolerances. The Meusburger solution is simple and efficient." The H-1000 Wizard sup-

ports customers like C-Form with the system configuration. There is a choice of six different plate sizes. "All accessories required are calculated automatically and the various clamping options can be defined with just a few clicks of the mouse," Dytko adds.

Additionally, the system can be quickly converted, and pallets turn the H-1000 into a multifunctional clamping system. "Meanwhile, we use the clamping system on all of our machines where possible," Cyganik says. "It definitely pays for itself after producing only a few moulds."

» **Meusburger,**
Wolfurt, Austria.
meusburger.com

Volvo slashes tool production time by more than 94%

Using a Stratasys Fortus 3D Production System, France-based Volvo Trucks has reduced turnaround times of certain assembly line manufacturing tools from 36 days to two days while reducing tooling costs.

Volvo Trucks' Lyon engine plant produces various engine types and sizes for the Volvo Group, including Renault Trucks, which the Group bought in 2001. According to Stratasys, Volvo Trucks has dramatically decreased turnaround times of assembly line manufacturing tools by more than 94% since incorporating Stratasys additive manufacturing technology at its engine production facility in Lyon, France.

Improving overall efficiency and flexibility

According to Pierre Jenny, manufacturing director at Volvo Trucks, the company has reduced the time taken to design and manufacture certain tools traditionally produced in metal, from 36 days to just two days in thermoplastic ABS-plus using its Stratasys Fortus 3D Production System. These significant gains in time are also improving the production plant's overall efficiency and flexibility; delivery times are upheld and

the use of additive manufacturing has saved costs by reducing wastage.

From a financial perspective, Jenny estimates that, where customised or small quantities of tools are required, the all-in cost of 3D printing ABS thermoplastic items is - in some cases - as little as 1€/cm³, compared to up to 100€/cm³ if making the same item from metal.

"Stratasys 3D printing has made an incredible impact to the way we work," he explains. "The capability to produce a virtually unlimited range of functional tools in such a short timeframe is unprecedented and enables us to be more experimental and inventive to improve production workflow."

Volvo Trucks purchased its Fortus 3D Production System from Stratasys' reseller CAD-Vision and within a three month period - had already 3D printed more than 30 different production tools to facilitate the way its production line operators worked. These include a range of different durable yet lightweight clamps, jigs, supports and even ergo-

nomically-designed tool holders that ensure a more organized working environment for operators.

"We're working in the heavy-industry sector, so reliability is naturally critical. So far every piece that we have 3D printed has proved to be 100% fit-for-purpose," adds Jean-Marc Robin, Technical Manager, Volvo Trucks. "This is crucial from a practical aspect, but also instils trust among operators and quashes any traditional notion that everything has to be made from metal in order to function properly," he adds.

AM enables design team to be more responsive

According to Robin, developing production tools using additive manufacturing also enables the equipment design team to be far more responsive, while avoiding possible wastage in the event of last minute design changes before tools are made.

"The fast and cost-effective nature of additive manufacturing means that we are far less restricted than we were even six months ago, allowing us to constantly improve our processes," he continues. "We now have operators approaching our 3D print team with individual requests to develop a custom clamp or support tool to assist with a specific production-line issue they might be having. Additionally, in the rare case that the design specifications of a traditionally-manufactured metal tool were inaccurate, the lengthy and costly design and manufacturing process had to begin again. With a 3D printed part, we can simply alter the design specifications and re-3D print the piece in a few hours," he adds.



Source: Stratasys

Using Stratasys additive manufacturing technology, Volvo Trucks has reduced turnaround times on certain clamps, jigs and supports from 36 days to just two days.

» **Stratasys,**
Rheinmünster, Germany.
stratasys.com



Here are two illustrations of the effect of part orientation. The part below was produced by three different additive manufacturing suppliers. The components they delivered were all different, because each supplier chose to orient the part in a different way. At right, delicate features are produced with differing levels of success depending on their orientation with respect to the machine's moving blade.

Additive's idiosyncrasies — producing functional parts

Additive manufacturing is not as easy as just hitting “print.” It demands attention to considerations that are characteristic of this process alone. Researchers describe some of the areas of attention that go into successfully producing functional additive parts. By Peter Zelinski

There is this photo I've seen from an organisation promoting additive manufacturing technology. Which organisation doesn't matter, because various companies marketing the technology have created images like the one I am thinking of. What this particular image shows is an at-ease young person, possibly a young engineer, casually pulling an intricate finished part out of a 3D printer.

The photo is not necessarily false. However, it allows a certain false impression to stand. Namely, the impression that additive manufacturing is easy, that it is different from other manufacturing processes in being casually simple to use to obtain the part as intended.

In fact, just the term “3D printing” is unfortunate in this respect. That term

implies that direct digital part-making is somehow as seamless and as straightforward as using a document printer. To be blunt, it is not.

Yet saying this does not detract from additive manufacturing's promise. Because of the design freedom it offers – plus its efficiency at low volumes, plus the opportunity it offers to consolidate assemblies, save material and reduce weight – additive manufacturing seems all but certain to take its place as an established, accepted option for part production. But like all other production options, additive manufacturing has part and process considerations all its own. It has engineering considerations all its own. It even offers plenty of room for failure, and the shops adopting additive manufacturing for metal parts in particu-

lar face a learning curve that is likely to be extensive.

One organisation that helps companies with ascending that learning curve is the Center for Innovative Materials Processing through Direct Digital Deposition, or CIMP-3D, at Pennsylvania State University. The faculty and researchers in this facility work with companies interested in additive manufacturing to explore processes such as direct metal laser sintering (DMLS), electron beam additive manufacturing and laser metal deposition. For all of these technologies, the value CIMP-3D offers is that it can help companies move more quickly through the trial-and-error period with additive manufacturing by guiding them in investigating the variables to obtain an additive process that is ready for their

own particular, proprietary ongoing production.

What are these variables? I recently had a chance to speak about this with Timothy W. Simpson, Ph.D., professor of mechanical and industrial engineering and a co-director of the center, as well as CIMP-3D R&D engineer Corey Dickman. Some of the variables in an additive process involve the adjustable parameters of a particular additive manufacturing machine. The user of a DMLS machine, for example, might alter the laser power and beam diameter for different jobs and different alloys. But other considerations are more universal to the nature of additive manufacturing. Just as CNC machining has inputs affecting success (such as cutter selection, feed rate and the rigidity of the workholding), additive manufacturing has comparable inputs that affect its success – inputs that the user of additive manufacturing learns to apply over time. Describing these inputs is helpful for developing a more realistic picture of what it's like to apply additive manufacturing in production. Here, then, are some of the factors that the user of additive manufacturing learns to consider:

1. Topology

To say that additive manufacturing permits complex parts does not go far enough, says Dickman. It does indeed permit this – growing a part in digital layers means that intricate structures for reduced weight are easy to create. However, the fuller truth is that additive manufacturing actually prefers this complexity. Tailoring the form of a part to match only the load that part has to carry and the service it has to perform results in an additive build that uses less material, requires fewer supports while the part is growing and is less prone to the accumulation of residual stresses.

The figure on the right shows an example. Penn State graduate student Jessica Menold submitted this entry in a GE-sponsored contest to redesign an aircraft bracket. Her design, if produced in metal, would be 88 percent lighter than the bracket that had previously been in use, while still meeting the design requirements for this part.

Yet how does the engineer who is seeking this kind of design optimisation—that is, this kind of improvement through subtraction—actually know

what material to subtract and what form ultimately matches the load paths in the part? Most design engineers have not had to face these questions, because they work with constraints so common to manufacturing that we don't even think of them as constraints. That is, designers are usually required to begin with a solid block or semi-net-shape form, machining away material to obtain external features. Elaborate forms are beyond consideration because machining can't produce them. Take this limitation away, and the resulting freedom is actually too vast for an unassisted engineer to know what form to select.

That is why additive demands a different approach to design, Dickman says. Software tools operating at a higher level than traditional CAD are employed to begin with boundary conditions defining the part's function and available space. These tools then calculate an efficient geometric form for those conditions through iterative mathematical analysis.

Most machine shops have never heard of these software tools, but they do exist, and CIMP-3D has grown accustomed to them. One choice at the high end, Dickman says, is Altair Optistruct. This software's geometric calculations are sophisticated enough that the software might need to be left running all night to perform a topology optimisation for a particular form. Less capable but easier-to-use optimisation tools include SolidThinking Inspire, he says.

2. Supports

One of the problems with the false picture of additive manufacturing literally “printing” a ready-to-use part is that this picture overlooks the amount of physical support the part is liable to require while being built. In metal additive manufacturing, support structures help transfer heat away from the part as new additive layers are added and also help hold the part's shape as it forms. A typical step in the design of a part produced additively is designing its support structures.

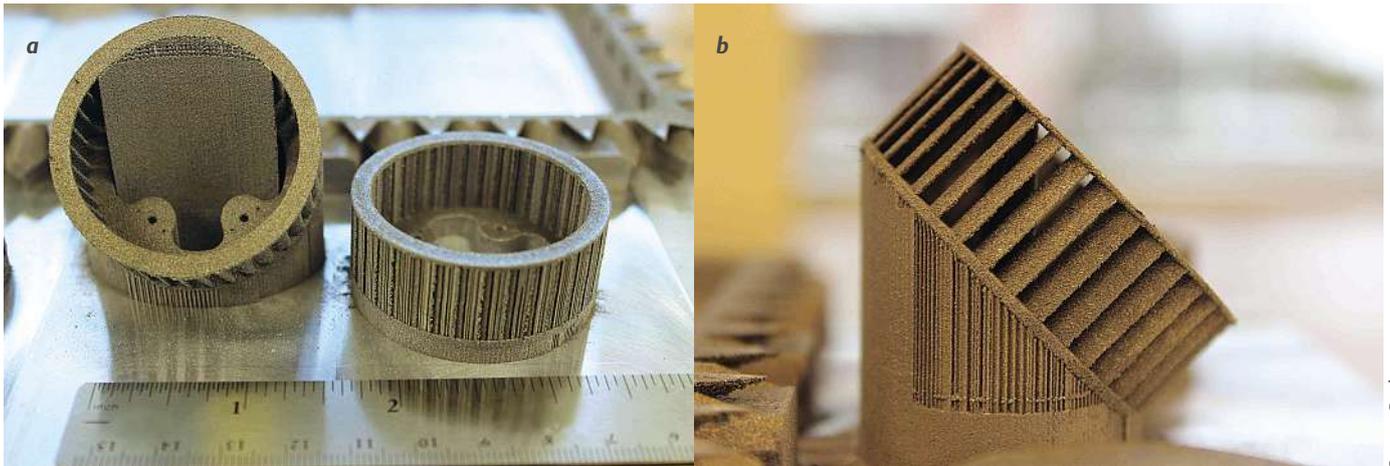
The figure on page 32 (bottom) gives an example of how extensive these support structures might be. The component relates to a project by a Penn State undergraduate student, Vincent Maranan, who applied additive manufacturing to produce a wheel's upright (connecting the hub and brake calipers to the suspension arms) for a competition involving student-designed race cars. On this part, the supports that were needed to preserve the bow-like features, the triangular peak and the large central bore together accounted for 50 percent of the build time for this part.

How are supports such as these removed when the build is complete? Additive manufacturing of metal parts still lacks an automated way to perform this step. Thus (perhaps strangely), one of the most advanced metalworking technologies is often followed by one of the most primitive. The supports on end-use production parts that are made through ad-



In the background is a plastic model of an existing metal bracket for an aircraft. The optimized design in the foreground, which would be produced additively, could meet the design requirements for the bracket with 88 percent less part weight. Software tools unfamiliar to many designers are necessary to pursue this kind of optimization of part forms.

Source: Gardner



Important process considerations in additive manufacturing include (a) the support of the part during the additive build and (b) the part's orientation. These choices are interrelated, as seen in this "cage" part with vertical fins that was additively produced at the CIMP-3D facility.

additive manufacturing are often removed with hand tools including a hammer and chisel.

3. Orientation

Did the part in the previous example have to be built so that it stuck up into the air like a shark fin? Maybe not. It could have been laid down on its side. Less support material would have been needed in this arrangement, and with less vertical height to cover, the build time would have been much less. But in this orientation, certain features of the parts might not have formed as accurately. Growing the part at something near a 45-degree angle might have offered an effective compromise. In additive manufacturing, searching for the right orientation of the part is an important aspect of finding the most efficient and effective process.

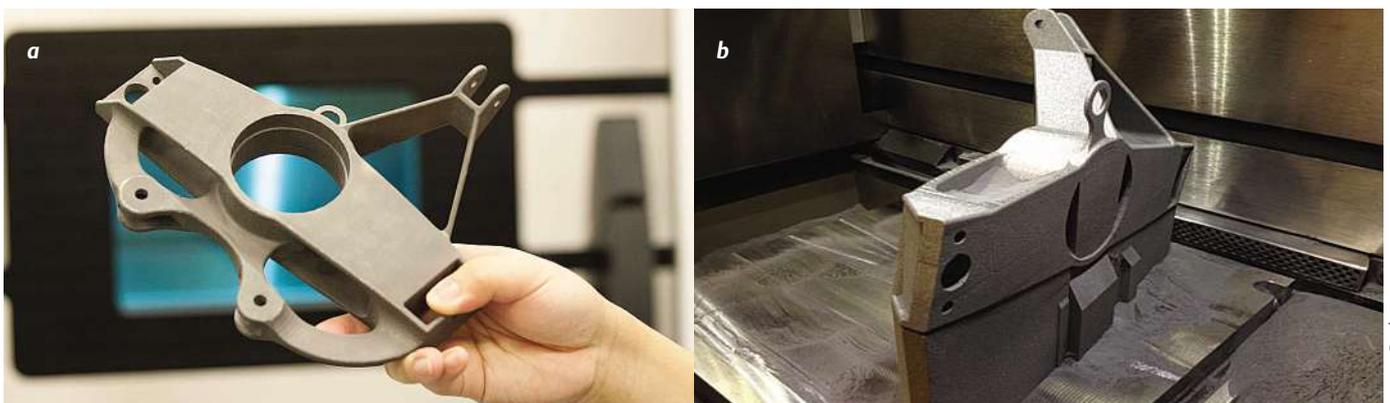
Simpson says this is part of the reason why the CAD model by itself no longer

conveys enough information to define the part. CIMP-3D saw a demonstration of this in a recent experiment in which it sent the same CAD model to three different providers of additive manufacturing services. Penn State graduate student Andrew Coward, who is involved in gas turbine research, designed a complex test part with features relevant to turbine components. All three additive suppliers were asked to produce the test part on their DMLS machines. Unknown to one another, all three independently chose to orient the part in different ways, and all three produced different results. Coward actually got back four parts, because one of the three suppliers tried it two different ways. Each of the resulting four parts was true to the CAD model in some details and violated it in others, and each part's set of true features and faulty ones was different from all of the others.

The test was rigged, Simpson says. The part was designed with internal and external features in so many opposing di-

rections that no single DMLS build could generate all of them perfectly. What the test shows, he says, is the kind of thinking that designers have to put into an additive-manufactured part. Even dimensional requirements are not necessarily helpful. Design engineers instead must prioritise which part features are more critical and which features can be left free to slightly depart from the model. For example, every model hole through a part is likely to be defined with a circular cross section, because designers are accustomed to holes being drilled. Simpson points to this as an example of a basic design assumption that now needs to be examined. That is: Which holes truly need to be circular?

He adds that the orientation of the part relates to more than just the direction of layers of material. On the DMLS machine, there is a recoater blade that might affect a delicate feature of the part or might leave it unharmed, depending on the orientation of this feature with



Support is a significant consideration affecting the cycle time and material use of a given part. Support structures for this additively manufactured component accounted for half of its build time.

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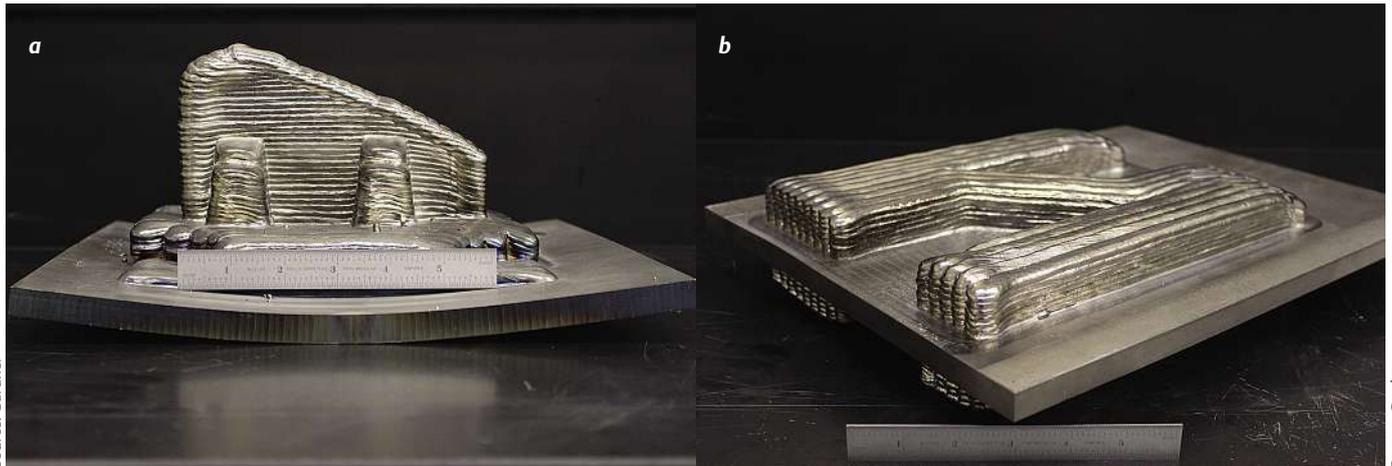


Renishaw's new metal powder bed fusion additive manufacturing system for industrial production, provisionally titled 'EVO Project', features increased emphasis on automation and reduced operator interaction. The system is the first to be designed and manufactured in-house by Renishaw, applying over 40 years of cross-sector engineering excellence that spans electrical, mechanical and optical technologies.

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Residual stress was sufficient to warp a 3/4-inch steel plate. One solution is to build mirror-image parts on opposite sides of the plate, thereby balancing the stresses.

respect to the blade. The figure on page 30 shows this.

4. Residual Stress

Alternatively, an additive-manufactured part might depart from the CAD model not because of any effect of its orientation, but instead because of residual stresses that accumulate as the part solidifies during the build.

The metallurgical formation of an additive part is complex, Dickman says. It is not precisely true that a given layer is added to the part as a liquid and becomes a solid thereafter. Instead, a given layer is affected by the heat of the layer added directly above it, somewhat less by the heat of the layer above that one, and on and on. Any layer of material thus continues to heat and cool, settling into its final integration with the rest of the part only gradually. The heating and cooling affects the material microstructure and creates residual stresses that build up in the part. Modeling this behavior so as to predict potential distortion from these stresses is one of the more important areas of CIMP-3D's additive manufacturing research.

The effect might be insignificant for a small part built within the typical additive manufacturing machine envelope. Yet the effect becomes pronounced as build sizes grow. The facility's electron beam additive manufacturing machine from Sciaky can build parts as long as 85 cm. The figure above shows an extreme example of the residual stress the facility has found in such large components. A 3/4-inch steel plate became bent 3/4 inch at each end because of the forces built

into this part as it was formed. The second photo in this figure illustrates a solution Sciaky has applied to this problem: building mirror images of the same part on opposite sides of the plate in order to balance the forces.

5. Powder

On a powder bed machine, says Dickman, the metal powder is expensive enough that a user needs a strategy for reclaiming and reusing powder left over after the build. The problem with this is that the powder at the end of the cycle is slightly different from the powder that began it. Smaller particles are inclined to melt more readily and tend to agglomerate onto the larger particles, so the leftover powder is biased toward larger particle sizes. Depending on the material purity requirements of the application, it might be possible to mix this leftover powder with virgin powder. But even at that, how many cycles is the powder good for before it has changed too much to assure a quality part? In any additive manufacturing process aimed at ongoing production, he says, the answer to this question has to be part of the process specifications. For CIMP-3D and other additive manufacturing firms, the implications and best practices of powder recycling is another area of study.

6. Material

One final process consideration is perhaps the most fundamental: the metal from which the part is made. The choice of metal for a machined part might not be the right choice if that same part is

redesigned to be produced additively. The design freedom of additive extends to the choice of material, because some materials that are difficult to machine are actually easy to apply in additive.

The reverse is also true. Some aluminium alloys, for example, while easy to work with in machining, are more difficult to process using a laser-based additive process. Meanwhile, titanium alloys, which might be seen as challenging to machine, are the most proven and best-understood metals when it comes to additive processing. In fact, the ideal material for a topology-optimised form (point number 1) is likely to be titanium, because of its strength-to-weight properties. And if the optimisation removes enough material from the design, then the new titanium part is likely to be lighter than the previously solid part.

Though we seldom think of this, says Simpson, part materials are usually selected with an eye toward machining. Hard-to-machine materials have a strike against them in winning acceptance. Now, he says, it's time to change that mindset, because that criterion biases us against certain metals that deserve to be more popular than they are.

Inconel, for example, has favourable properties appropriate to a range of applications. It should be used more widely than it is. It's just that it's difficult to machine. But in a near-net-shape additive process in which the amount of stock to be removed is much less, Inconel might be free to play a larger role. **ETMM** This article first appeared in *Additive Manufacturing*, additivemanufacturinginsight.com, reprint courtesy of Gardner Business Media, Cincinnati, Ohio, US.

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The Eosint M270 builds metal parts using Direct Metal Sintering (DMLS). The technology fuses metal powder into a solid part by melting it locally using a focused laser beam.

Direct metal laser sintering: Rebuild, don't replace

If you could rebuild a damaged or worn-out mould insert instead of replacing it with a new one, wouldn't you? By Christiana M. Fuges

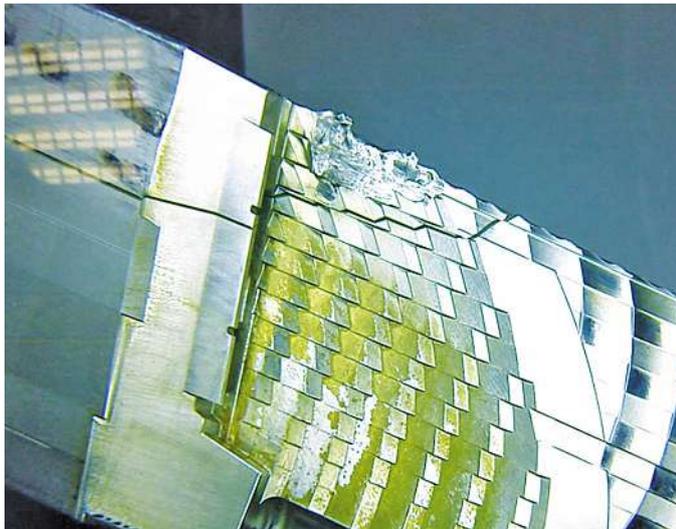
Repairing damaged mould inserts is a growth area for additive manufacturing, particularly for direct metal laser sintering (DMLS). Rather than replacing damaged tools, DMLS can be used to quickly repair only the damaged areas, resulting in simplified repair, decreased downtime, longer operating life and reduced costs associated with maintenance and repair.

Welding has limitations, is time-consuming

Conventional repair processes can require multiple steps and be time-consuming. Welding, for example, requires cutting out the broken or worn area, fixing a new block of steel, performing the welding and completely re-machining the insert. It also can involve additional

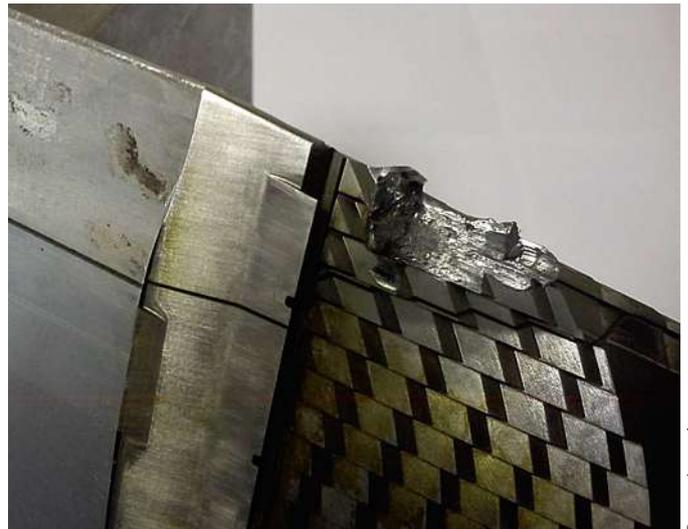
steps such as machining, polishing, testing, etc., and it has limitations, such as the durability of the repair.

The need for faster, more economical ways to repair mould inserts has opened the door for DMLS. Two companies, Eco-parts (Switzerland) and Innomia (Czech Republic), have walked through that door and now offer customers the speed and cost advantages of DMLS tool repair.



Source: Innomia

DMLS is suitable for repairing damaged edges or corners.



Source: Innomia

The damaged area can be completely rebuilt.

Innomia provides plastic and metal part design and development using reverse engineering, 3D scanning and additive manufacturing. Ecoparts is an EOS service provider that produces prototypes, short runs and tool inserts, as well as hot runner water-cooled gate inserts, for the mould and die and mechanical engineering industries.

“In general, laser welding is very good for repairing damaged corners, edges or thin layer defects when there is no need to add to the material’s volume,” says Lubos Rozkosny, managing director of Innomia (innomia.cz). “When it’s more suitable to add material volume to repair the damaged area, DMLS is very efficient. It can bring material back to the exact 3D geometry specified by the part’s 3D model. This is not possible using laser welding because the process is manually controlled. DMLS can because the laser beam is computer-controlled by the CAD file.”

Melting layers of metal powders from the bottom up

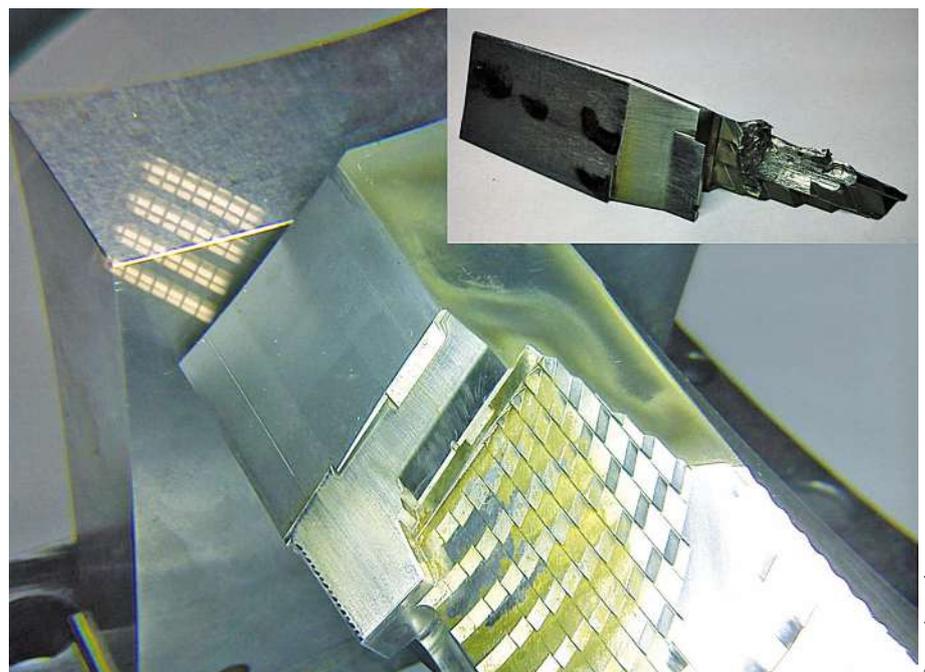
In general, DMLS works by melting very fine layers of metal powders from the bottom up until the build is complete, creating a single homogeneous part made of steel. To start, a thin layer of pure tool steel powder material is applied to the building platform. A powerful laser beam then fuses the powder at exactly the points defined by the computer-generated component design data. The platform is then lowered and another layer of powder is applied. Once again the material is fused so as to bond with

the layer below at the predefined points. When it comes to insert repair, however, DMLS has a different approach. “You don’t repair the inserts by welding together two broken or damaged parts,” explains Daniel Kundig, owner and managing director of Ecoparts (ecoparts.ch). “Instead, you completely rebuild the damaged area of the insert. This ensures a homogeneous microstructure in the parts, without having visible weld lines on the repaired insert.” After the DMLS process, inserts can be post-processed (for example, via milling or polishing), as required. The insert’s functionality is saved and reestablished.

Metals used in DMLS offer good mechanical properties

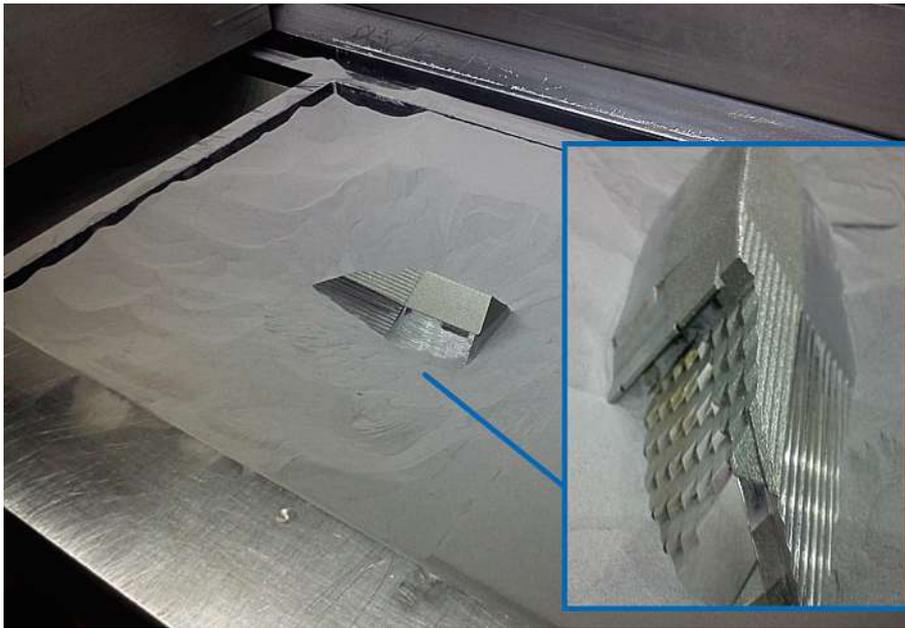
DMLS melts material back onto the damaged area, and metals used in DMLS offer very good mechanical properties, Rozkosny says. For example, MS11.2709 maraging steel offers a hardness ranging to 54 HRC. (Heat treatment can be used to adjust the hardness between 34 and 54 HRC.)

In addition, different tool steels can be combined, limited only by the size of the sintered surface and weldability of the materials. DMLS also runs in an airtight chamber under an inert nitrogen



Source: Innomia

Innomia also uses 3D scanning and reverse engineering to repair damaged tools, even when 2D or 3D documentation is unavailable.



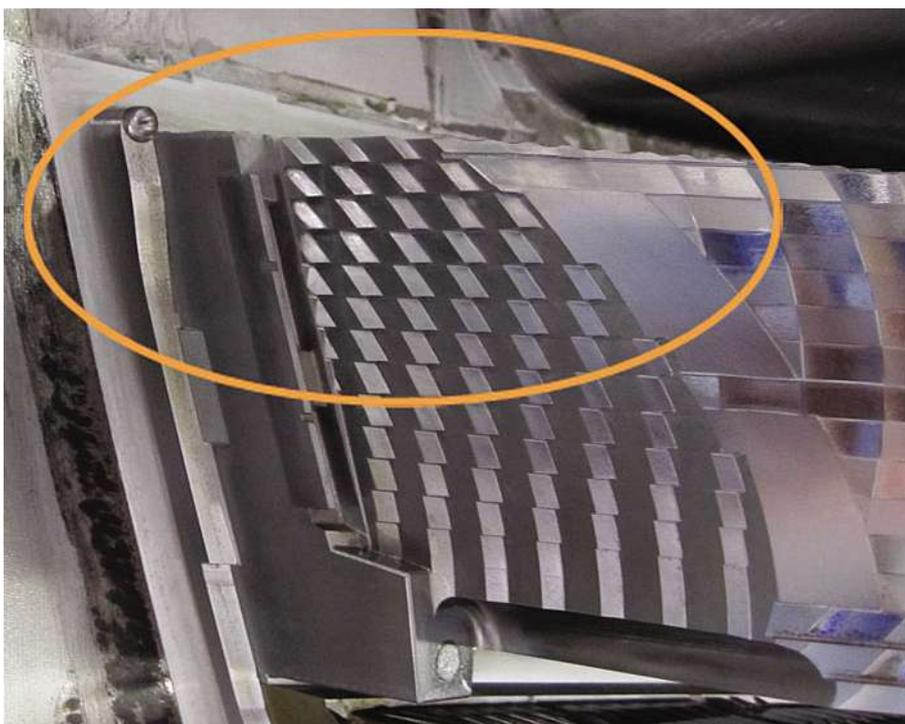
Source: Innomia

Innomia and Ecoparts have seen growing demand for the use of DMLS to repair mould inserts, as it simplifies and speeds the repair process. Instead of replacing inserts, both companies remove only the damaged material for their customers.

atmosphere, ensuring a very good metal structure. Finally, it offers short lead times and suitable quality, Rozkosny says.

Innomia and Ecoparts do see a few limitations to using DMLS, however: (1) current chamber size (250 x 250 x 325 mm) limits the size of parts that can be repaired; (2) surface finish is rough (about 10 Ra), requiring conventional

finishing processes; (3) the layer-by-layer process demands a flat surface; and (4) only one material (1.2709) currently is approved for tooling. However, the high accuracy and surface quality after finishing that DMLS offers make it an ideal platform for tooling applications, including tool repair. Also, inserts repaired using DMLS are proving to prolong tool life.



Source: Innomia

Repaired area after surface finishing.

Kundig adds that part complexity also is not a cost driver with DMLS. “Simple or complex structure, free-form shape or conformal cooling, the industrial 3D printer just manufactures the part,” he says.

Growing demand for DMLS to repair mould inserts

Both Innomia and Ecoparts have seen growing demand for the use of DMLS to repair mould inserts, as it simplifies and speeds the repair process. Instead of replacing inserts, both companies remove only the damaged material for their customers. In most cases, this alternative to completely remanufacturing an insert saves weeks in production time.

According to Rozkosny, Innomia initially ventured into metal additive manufacturing with rapid prototyping of automotive metal components but then moved to injection mould applications, including rapid tooling and conformal cooling. Since then, customers have come to trust the quality of DMLS parts in production tooling, he says, so demand for fast tool repairs grew very quickly.

When it comes to tool repair, Innomia uses not only DMLS, but also 3D scanning and reverse engineering. This allows the company to repair damaged tools, even when 2D or 3D documentation is unavailable. For one particular repair on a broken injection mould insert, there were no existing 3D data or drawings, and limited parts in stock.

“The insert was removed from the tool and delivered to us,” Rozkosny explains. “First we scanned the insert geometry and redesigned the complete 3D model. Then we cut or milled off the damaged area because we needed a flat surface to start the rebuilding process. The insert was then placed into the EOSINT M 270 system and positioned, and the missing material was laser-sintered on the cut surface. Next, the surface was finished and the insert was mounted back into the mould.” The job, from insert removal to production restart, was completed in three shifts, and the repaired insert has been in use for two and a half years now, demonstrating the repair’s quality and durability, he says. **ETMM**

This article first appeared in Additive Manufacturing, additivemanufacturinginsight.com, reprint courtesy of Gardner Business Media, Cincinnati, Ohio, US.

Build processor simplifies 3D printing process, gives users greater control



Source: Renishaw

Renishaw and Materialise have launched what they call “the de facto standard for simplifying the 3D printing process”, the Renishaw Build Processor. According to Renishaw, the company combined its extensive process knowledge with Materialise’s Magics software’s .stl editor and build preparation software to enhance the capabilities of the AM250 additive manufacturing system. The Build Processor is said to allow users to input an .stl file from any CAD package or to import native CAD formats directly into the Mag-

ics software. They can then edit, manipulate and heal models before orientating and adding build supports. Furthermore, the Renishaw Build Processor allows material files to be freely designed and edited before an output is created, which can be read directly by the AM250 system, Renishaw says.

The company adds that its Build Processor offers users a flexible platform. “With this highly flexible platform, the user is able to control up to 170 parameters, fully utilising Renishaw’s open source parameter ethos. However, it maintains a user-friendly interface, using predetermined parameters so that the build can be prepared in a few simple steps,” says David Ewing, product marketing engineer at Renishaw. The large suite of functions is also said to give users greater control of the build.

» **Renishaw,**
New Mills, UK. renishaw.com

Industrial 3D production system for versatile, faster additive manufacturing

Stratasys has introduced the industrial-scale Objet 1000 Plus 3D production system which is said to offer extra large print size and accelerated speeds for demanding manufacturing applications including aerospace, automotive, medical devices, and consumer products as well as for service bureaus and unis.

According to the company, the Objet 1000 Plus brings versatility to the world of large-scale 3D printing in its



Source: Stratasys

Users can choose from more than 100 Stratasys materials including the polypropylene-like Endur.

ability to mix materials and part sizes while maintaining ultra-fine precision. Its extra large build envelope (1000 mm x 800 mm x 500 mm) is efficiently traversed with an optimised print block movement that accelerates print speeds up to 40% faster than its predecessor, Stratasys says. It adds that this productivity boost alongside other refinements and simple post processing, results in reduced cost-per-part.

Users can choose from more than 100 Stratasys materials including the polypropylene-like Endur. According to the supplier, the Objet 1000 Plus can produce tough parts with smooth surface finishes in high-speed mode while taking advantage of the new Endur Digital Materials which combine two resins in a single material for a wider range of material properties.

» **Stratasys,**
Rheinmünser, Germany.
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Cover picture: cooling element, citim GmbH,
Photo: Barbara Neumann



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Cover picture: Frederik Brückner and
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Photo: Barbara Neumann

Solidscape pushes 3D printing boundaries

The US-based manufacturer of high-precision 3D printers for direct manufacturing applications specialises in printing 3D wax patterns for lost-wax casting and mould-making applications. CEO Fabio Esposito talked to Martin Courtney.

Founded in 1994, Solidscape is a 3D printer manufacturer with 5,000 customers worldwide, 45% of which hail from Europe, with the rest split equally across the US and Asia Pacific. The company is a wholly owned subsidiary of additive manufacturing system maker Stratasys, which acquired Solidscape for \$38m in 2011.

Moulds for complex, intricate jewellery

Almost all of Solidscape's revenue – estimated at \$13.4m for the 2010 calendar year – comes from business-to-business (B2B) sales. The company has a particularly strong user base amongst jewellery manufacturers, who use its 3D printers to create moulds for their product designs, but its 3D printers are used widely

in dental applications for the manufacture of crowns, bridges and partial dentures, and by component-makers serving the automotive and aerospace industries.

“One of the things we have specialised in is moulds used in the manufacture of very complex, intricate jewellery where the wax that we produce has been able to fulfil the burnout and shrinkage requirements,” Fabio Esposito, Solidscape president and chief executive officer tells ETMM. “We can do droplets with about 66 µm, which is one of the most precise and accurate technologies out there, but at the other end it is about material behaviour.”

Solidscape launched its MAX² 3D printer in May 2014, a device aimed at the high-precision casting market looking for a device to create wax patterns that can be used to make moulds of up

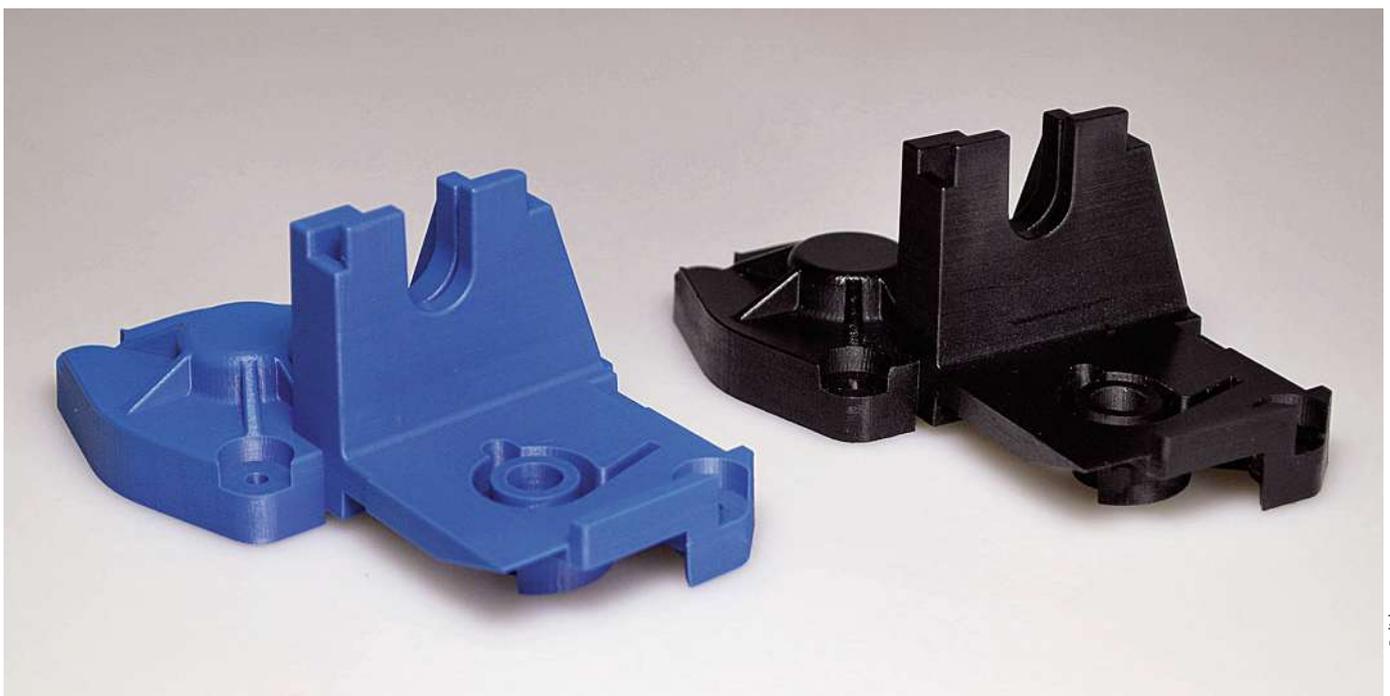
to 152 mm x 152 mm x 100 mm in size for end-use parts in a variety of materials, from metals such as bronze, brass, silver and aluminium to ceramic, for example.

Esposito cannot reveal how many MAX² devices Solidscape has sold to date but says there is also strong demand from educational institutions.

Advanced research applications

“I cannot disclose the details but we have intimate relationships with universities such as Cambridge and the University of Central England where we play a key role in advanced research applications, which are extremely demanding,” he says.

Relatively few companies currently use 3D printing in their component



An LSR wax and casted part. The prototyping experts at LSR take wax patterns directly to silicone tooling or to cast metal parts without the traditional laborious hand-finishing needed for 3D-printed prototype parts.

Source: Solidscape

manufacturing operations, but Esposito believes that will change given the time to market and cost advantages the new technology can bring, particularly where 3D printing is used to replace moulds that have traditionally been hand-carved.

“There is clear return on investment because at the end of the day we replace partial or completely manual processes that would otherwise be done by hand, which with a 3D printer can be done in a much shorter period of time,” Esposito says.

Eliminating manual work

An example comes from LSR’s Design Studio, a team of industrial designers, app developers, mechanical engineers and prototype specialists that provide product development services for the wireless communications industry. LSR reports that using Solidscape devices to print at 5000 dpi resolution can reduce its time to market by allowing the prototype experts to go directly to silicon tooling or to cast internal parts without having to manually hand-finish components.

Jim Hollister, 3D Lab Manager at LSR, estimates that one recent project to create a mini-bracelet using Solidscape technology had enabled the Design Team to go from weeks of machining time and spending \$4,000 to make a single set of metal parts to under two days and \$200 for the same product.

“Basically, we started creating a silicon mould using our wax material, which could be used at room temperature rather than 105°C, which means no melting and shrinkage,” says Esposito.

Printers to produce larger moulds at less cost

Whilst news of 3D printing benefits for mould makers is being rapidly spread by word of mouth, the next steps towards taking the technology mainstream could be to build printers able to make much larger moulds at less cost which and seamlessly integrate them into companies’ existing manufacturing environments and processes.

“We need to work on making that [printer] bigger, better, faster and cheaper but at the same time as you start looking at manual processes and production you always need better materials,” Es-

Three questions for... CEO & President Fabio Esposito

How can tool and mould makers take advantage of Solidscape’s technology?

Esposito: Tool and mould makers can use this proven 3D printer technology to dramatically shorten traditional prototyping and tool-making processes. For instance, at the recent Euro Mold event, Solidscape and LSR Design Studio announced disruptive new prototype processes that will speed time to market. By combining Solidscape’s high-precision printing with LSR’s silicone or metal mould-making process, prototypes can be created in less than two weeks, compared to the typical five to six weeks needed to create most new plastic or metal parts.



Source: Solidscape

Solidscape President and CEO Fabio Esposito expects the AM market to continue to grow at a rapid pace.

How do you expect the additive manufacturing (AM) market to further develop in 2015?

Esposito: The AM market will continue to grow at a rapid pace as the adoption rate continues to soar. 3D printing is now a mainstream, industry-changing technology that is moving from just prototyping to full manufacturing applications.

How do you judge the overall development of the manufacturing industry in Europe and worldwide in 2015?

Esposito: We see across-the-board increased demand in key manufacturing sectors ranging from jewelry to aerospace, automotive, medical, IGT and commercial casting. Europe remains strong and the global market looks good with growth in Asia and North America.

Fabio M Esposito is the president and chief executive officer of Solidscape and also sits on the advisory board of Rivanna Medical, a US start-up specialising in the development of 3D imaging capabilities for portable ultrasound systems in health-care applications. Prior to joining Solidscape in 2007, Esposito served as vice-president at German robotics and imaging company ISRA Vision Parsytec. Esposito holds a degree in engineering and a Master’s Degree in Electronics from the University of Naples Federico II in Italy.

posito says. “Manufacturers have invested lots of money in their existing infrastructure and automation processes, so the last thing they want to do is bring too much change into their existing facilities.”

Never change a running system

“So they want a printer, materials and software that can be accommodated

without them having to change what they already have — that the wax that comes with the printer can be treated in exactly the same way as they have treated traditional waxes, for example — and that is what we need to do. That is of paramount importance and is where a substantial portion of investment is going,” the CEO concludes.

» **Solidscape**, Merrimack, USA.
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Improved injection moulding simulation tool

Software and engineering company Simpattec has released a new version of its injection moulding simulation software, designed to further optimise the moulding process. Users are said to benefit from a more efficient workflow and additional options.

A balanced conduct of cost, quality and efficiency during every stage of the product and tool development process guarantees coping with the daily challenges encountered within the market. With the new release of Moldex-3D R13 multiple enhancements, a significant increase in the quality of the component, a more efficient workflow and additional options and handling improvements are available to the user, the supplier says. These are said to allow companies to get the most out of virtual simulation for injection moulding and thus create core competitiveness and add a substantial amount of value to their products.

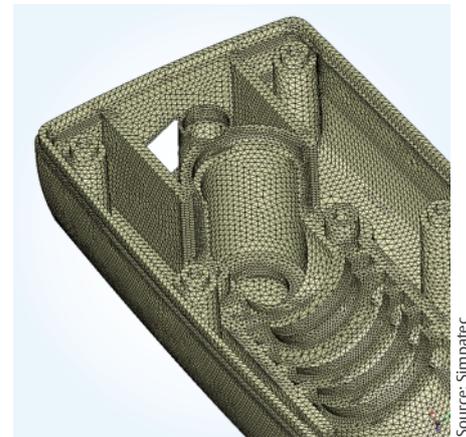
Improved kernel efficiency, good graphical performance

Moldex-3D R13 offers explicit advantages in terms of kernel efficiency, Simpattec says. A lot of thought has been put into these technical possibilities. Accord-

ing to the supplier, the user can now achieve optimal graphical performance as the rendering efficiencies have been enhanced by a factor of at least 2 to 5 times. This is said to lead to a better and smoother representation of results.

One valuable asset in Moldex-3D R13 is that a special focus has been set on improving design geometry-based runners, thus making it possible to compose a more realistic feeding system applied in the industrial moulding process, the company explains. Various cross-section types of runners are supported, which has an immense effect on enhancing the modelling flexibility and improving the flow balance.

Furthermore, a lot of thought has reportedly been given to the so-called "Gate Location Advisor". This special feature of Moldex-3D R13 provides ideal conditions for giving advice on the optimal gate location based on part geometry before running an analysis, Simpattec says. It adds that another advan-

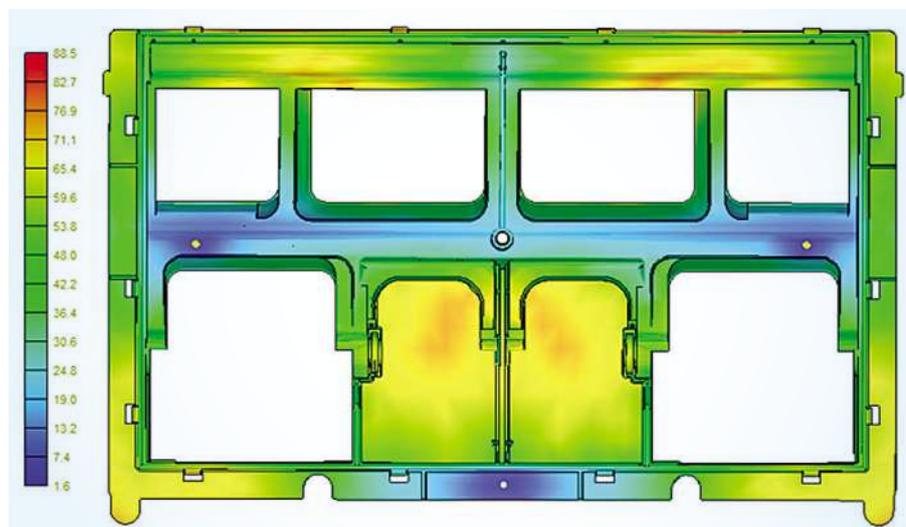


Rendering efficiencies for graphic performances have been increased by 2 to 5 times and lead to a better and smoother representation of results.

tage is that the flow balance is improved and it minimises repeated validation for filling issues, such as short shots or welding lines.

Interface to major FEA software versions

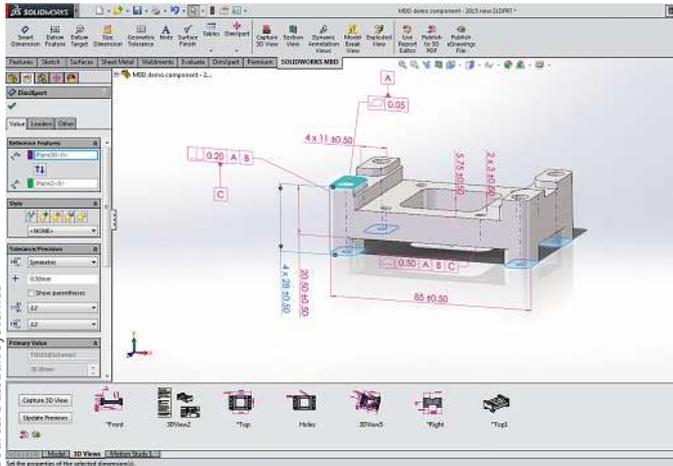
Another special feature now implemented into the new version of Moldex-3D R13 is that the integration possibilities of the Micromechanics interface with Digimat and Converse have been increased, the supplier says. This particular characteristic also offers more output options for analysis results from Moldex-3D, such as volumetric shrinkage, temperature distribution or residual stress. According to the company, Moldex-3D R13 offers interfaces for advanced structural assessments to the major FEA software, including ANSYS, ABAQUS, Nastran, Marc, LS-DYNA and Radioss.



Shown is the automatic identification of optimal gate locations based on the component geometry. Reduction of the validation time and the elimination of unwanted filling problems, such as short shots or welding lines.

» **Simpattec**,
Aachen, Germany.
simpattec.com

3D tool for model-based design speeds up production



Source: Dassault Systèmes

Dassault Systèmes has announced the launch of Solidworks Model Based Definition (MBD), a drawingless manufacturing application. According to the supplier, Solidworks MBD provides engineers with a 3D tool for model-based design that improves technical communication, accelerates design and manufacturing processes and saves production time and costs.

As the use of 3D in today's industrial design and manufacturing processes becomes more prevalent, traditional 2D engineering drawings are proving to be time-consuming, error-prone, and non-compliant with industry standards. These inefficiencies waste valuable time, money and resources, the company explains.

With the Solidworks MBD application, engineers can now generate one master document for all product and manufacturing information, downstream processes, and compliance with regulations and standards without having to produce and maintain separate sets of expensive 2D engineering drawings.

“Model-based definition methodologies have been shown to reduce manufac-

turing errors and avoid the expense and time associated with developing 2D drawings, which can run up to 50 percent of total development costs,” explains Gian Paolo Bassi, CEO, Solidworks. “Every new Solidworks application that we develop is a reflection of the user community’s needs. We’ve tailored Solidworks MBD to offer patent-pending engineering innovation for easier product design and manufacturing and faster time-to-market.”

Solidworks MBD is said to enable more streamlined technical communication using industry standard file formats. Engineers can define, organise and publish product and manufacturing information directly in 3D to improve communication between design and manufacturing teams and reduce the risk of errors, the company says. Solidworks MBD is a key addition to Solidworks 2015 product portfolio unveiled last September. It covers all aspects of the product development process with an intuitive, integrated 3D development environment.

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Barrel tool technology lands in UK aerospace industry

Aerospace manufacturing has long relied on machining that prioritises precision over speed, in the time honoured ‘slow and steady’ tradition. Now a new approach using barrel tools claims to offer the best of both worlds. By Adrian Smith, Open Mind Technologies

The UK aerospace industry accounts for 17% of global market share, making the UK the largest aerospace industry in Europe, second only to the US. With 2600 UK companies employing over 230,000 staff in the aerospace market, the sector generates over £30bn of UK revenue, 75% of which is exported.

Aerospace industry important to UK economy

By 2032, it is estimated that 29,000 new large civil airliners, 24,000 business jets and 5,800 regional aircraft will be required – valued at over US\$5 trillion. Overall, this is a potential market value of around US\$600bn for the UK over the next 20 years. The industry is of such importance to the UK economy that the government is committing £10bn in development funds. Key players include GE, GKN, Airbus, Rolls Royce, Bombar-

dier Aerospace, Augusta Westland, BAE Systems and many other globally renowned names manufacturing in the UK.

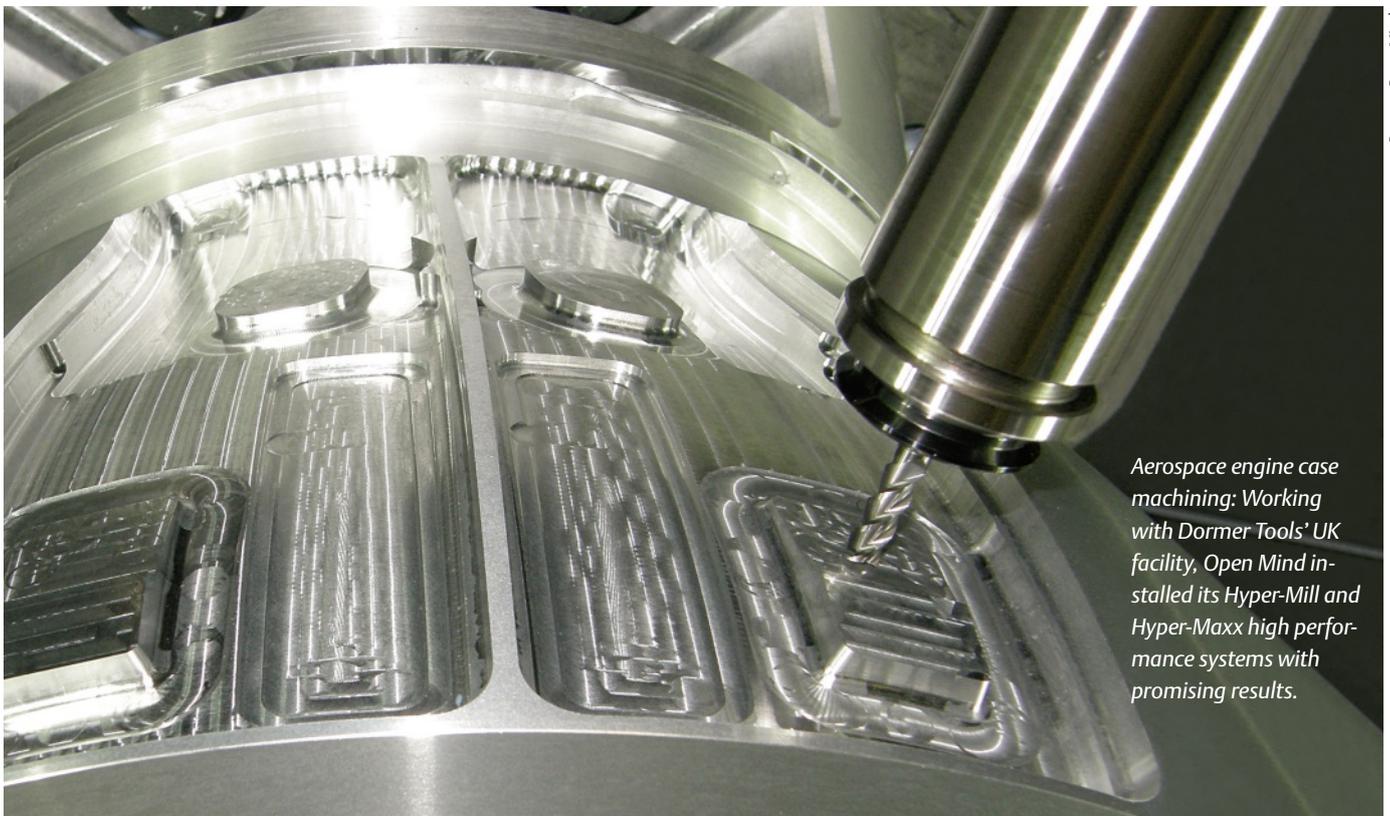
Working with Dormer Tools’ UK facility, Open Mind installed its Hyper-Mill and Hyper-Maxx high performance systems with promising results.

Matt Johnson, a Dormer Tools Machining Applications Engineer says: “I was invited by an Open Mind engineer to supply tooling for a demonstration piece at Warwick University. Using Open Mind’s Hyper-Mill, the previous machining time for the 18 mm deep pocket in the 316 stainless steel part was 25 minutes. I supplied our S356 solid carbide end mill and changed the cutting parameters to slightly reduce feeds and speeds, but machine the full 18 mm depth in one pass as opposed to the previous program that used three 6 mm deep passes. Then the Open Mind engineer turned on the

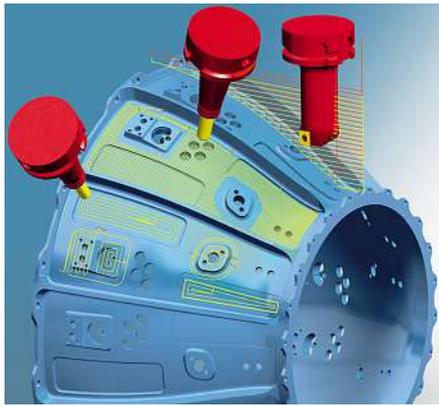
Hyper-Maxx roughing cycle and asked me to treble the recommended Dormer feed and almost double the speed rates for the cutter.”

Gains in performance measured by the Q_{max} value

Most cutting tool manufacturers measure productivity benefits by calculating the Q_{max} value for the machining cycle, this cubic (cm/min) value is the Depth of Cut times Step Over times Feed divided by 1000. “In this demo the original Q_{max} value was 17.1ccm/min, using the Dormer 12 mm cutter at the recommended parameters resulted in a Q_{max} value of 30 ccm/min, a significant gain. However, when the Hyper-Maxx module was turned on, it gave us a value of 108 ccm/min, a 280% improvement. Compared to the first test piece, the result was a 630% improvement,” says Mr Johnson.



Aerospace engine case machining: Working with Dormer Tools’ UK facility, Open Mind installed its Hyper-Mill and Hyper-Maxx high performance systems with promising results.



Source: Open Mind

Open Mind supports new tool forms like barrel tools, giving the user increased programming flexibility.

"We are currently machining a structural wing component from titanium for an Open Mind and Dormer customer. Like the Open Mind customer, we are using the same Dormer S357 12 mm carbide cutter with a 3 mm radius and we extended tool life from 30 minutes to over 2 hours – a tool life improvement of over 200%. The only difference is that we are using Hyper-Maxx," he says.

With regard to the production of the structural aerospace part, the customer was taking 40 hours to machine two sides of the component. This is now says to be 10 hours. "The aerospace subcontractor has a contract to produce over 150 parts that was taking close to a week to machine each part. To demonstrate cycle time reduction with Hyper-Maxx, one pocket was previously machined in 40 minutes. Dormer is now milling the pocket in 3 minutes. To achieve such a result and simultaneously improve tool life is exceptional," Johnson adds.

Heat management as a key to productivity

When machining difficult aerospace grade materials, the hard and abrasive nature of the alloys generate significant heat. It is this heat, when not correctly controlled and distributed evenly, that rapidly degrades the cutting edge and reduces the tool lifespan; the consequence is that the manufacturer often has a trade off between maintaining productivity levels and excessive tool wear and its associated costs.

There are many techniques for machining challenging parts in modern highly refined aerospace materials. For many, the time honoured 'slow and

steady' approach is no longer cost effective and leads to lost orders or very slim profit margins, forcing many to decline to quote for the manufacture of components that are well within their production capabilities. The solution may be to 'work smarter', adapt and apply modern toolpaths and tooling.

As the global aerospace industry strives for weight reduction in component parts, the shape of the part becomes more organic, closely aligned to the form of the surface it mates to. To this end, Open Mind has worked closely with cutting tool manufacturers in the UK on barrel tools. The barrel tool concept is a type of ballnose end mill cutter with an excessively large radius ground on the flank. For example, a 10 mm diameter ball nosed cutter will have a 5 mm end radius whereas a 10 mm barrel cutter may have a radius of 20, 50 or even 100 mm.

Hyper-Mill supports three types of barrel tools

Here, the step-over value of the barrel cutter can exceed that of the ballnose cutter by a factor of 20. The result is an increased contact area between cutting tool and work piece, reducing the number of machining passes to generate the surface to the required tolerance. The tool is says to gain a longer life span (as the material is cut evenly and smoothly over the long contact area), better metal removal rates and a reduced cycle time.

During the development phase of the barrel tool support within Hyper-Mill, Open Mind UK has worked with Yamazaki Mazak UK and specific aerospace customers to highlight the benefits of the technology. On one aerospace component the cycle time was claimed to fall from 1 hour 40 minutes to just 20 minutes, in 304L stainless steel.

Hyper-Mill supports three different types of barrel tools in 5 axis cycles to allow a simple user friendly programming process for machining complex components where the floor or wall or both floor and wall combinations must be machined without mismatch. These combined with lens cutters and traditional tooling give a range of tools to machine complex parts.

» **Open Mind Technologies,**
Bicester, UK.
openmind-tech.com

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Michigan firm switches to single machining software

Employing a variety of machining software can lead to time-consuming staff training and maintenance needs. Now a Michigan-based manufacturer of large components has implemented a single software regime for its production process with promising results.

Paragon, which is based in Grand Rapids, Michigan, US, is best known for producing very large, and very accurate, tooling and components. The company serves a variety of industries, including automotive, heavy truck, oil and gas, aerospace, defence, marine and nuclear. This diversity has been an important part of the company's approach. "We can cross-pollinate ideas from different projects," says Paragon President, David Muir. "What we learn in one industry, like aerospace, we're able to apply in injection moulding or vice versa, or even in compression or hydro-form tooling."

How to eliminate complex training needs

In contrast, a diverse range of programming software used to be a major problem. "We had too many software programs on the machine floor," remembers Muir. "That problem was causing a lot of

inefficiencies with our training and the ability for our staff to move from one station to another. We explored the idea of looking for only one software program across the whole shop and decided on Delcam." But the decision wasn't only about the nature of the software. "Delcam brought us a willingness to listen to what our company needed," says Muir. "Most of the competitors told us 'This is how it's going to be' but Delcam says 'What can we do to make your business more profitable?' We needed more customised input and, instead of being the traditional software vendor that pushed back and tried to fit us into its product, Delcam gave us direct access to their development team."

"Delcam has been giving us regular training on site," adds Andrew Samrick, Vice President of Manufacturing. "We were able to move from zero knowledge to a better cost performance in less than six months. We've got some great 'mad

scientists' who can think up these incredible things. Powermill has helped us to take their focus off the day-to-day issues and to begin to look forward. The type of equipment that we build is among the largest of its kind but that's simply a stepping stone towards being able to build more custom solutions for specific customer needs."

Dealing with a shortage of skilled labour

One area where Paragon needed extra support was dynamic machining control for the company's large 5-axis machines. Paragon staff worked with Delcam developers to create the integrated mechanism for optimising 5-axis positioning in the 2014 R2 release of Powermill. Another factor was the availability of skilled labour. "There is a shortage of labour out there right now, especially of skilled machinists," explains Muir. "That shortage means that we need to find technology that takes the labour that we have and applies it across more machining time."

To tackle the problem, in 2013, Paragon decided to start a training programme within the company called Paragon Technical University. Dean of PTU, Larry Oppenhuizen, explains, "We have twenty-six apprentices currently learning Powermill. Now that we are using the same software throughout the plant, an apprentice that is learning Powermill in, for example, the small machine department can go over to another department more quickly as he already has Delcam knowledge. It makes it easy for us to give our apprentices a good rounded education because they only need to learn one set of software."



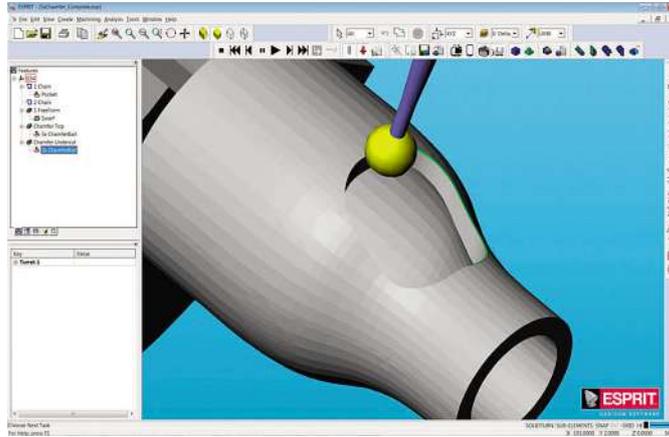
Source: Delcam

Paragon produces accurate, large tooling and components and worked with Delcam to create an integrated mechanism for optimising 5-axis positioning.

» **Delcam,**
Birmingham, UK.
delcam.com

Latest software release with improved intelligent and strategic machining, CAD-CAM data exchange

CAM software provider DP Technology has released a new version of its flagship product Esprit 2015. According to the company, Esprit helps increase productivity for a full range of machine tool applications by generating more efficient toolpaths while also saving time by providing substantial improvements in computer numerical control (CNC) programming productivity. Besides increasing productivity, the release is also claimed to provide improved features specifically in the areas of intelligent machining, strategic machining, CAD-CAM data exchange and Cloud-Enabled CAM. Intelligent machining features in Esprit



Source: DP Technology

2015 accelerate the machining process by providing unique 5-axis cycles that reduce cycle time, the supplier says.

This is said to make it possible to completely machine blades in a single setup.

Esprit's 5-axis blade roughing tool motion is morphed across the blade from any size stock shape to uniformly offset stock allowance so it can be immediately followed by a finishing cycle. For example, the port roughing

cycle creates a 5-axis roughing operation to remove the material inside an area where the tool must enter through a restricted opening. The shape of the tool-path is an offset of the port surfaces, starting at the surface and proceeding inward at a constant stepover.

Esprit 2015 also includes features that increase machining productivity, DP Technology says. For example, the bottom up roughing strategy helps take Esprit's Profit-Milling high speed material removal cycle to the next level.

» **DP Technology,**
Montpellier, France.
dptechnology.com

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CAD/CAM For Toolmakers

Motion profiling sets tools on the right path

Unattended out-of-hours machining is an important function some VMCs offer to maximise productivity. A British firm of toolmakers is making the most of its networked three and five-axis machines and their path smoothing capabilities.

Family-owned RP Tooling in Kingswinford targets business in industry sectors that are buoyant at any given time. The policy has allowed the 33-employee firm to grow considerably, a process that has seen three relocations since its inception in 2005. The latest move, at the end of 2014, trebled the size of its factory to 2,300 square metres.

Toolmaking was always at the core of the business and within the past couple of years, founders Brett Mitchell and Darren Withers have set up a plastic injection moulding facility. It comprises six Borche presses rated at between 60 and 320 tonnes for low volume, short lead-time production of high value components with a shot weight of up to 1.2 kg.

Half are destined for the automotive industry, either as trim or under-bonnet items on vehicles like the Range Rover Sport, Audi R8 Etron, F-Type Jaguar and Ford Ranger. The remainder could be components for anything from medical

equipment to lawn mowers to boilers.

Underpinning manufacture of the mainly aluminium moulds are 3-axis vertical machining centres (VMCs) from Hurco. The company opted for the brand due to the claimed rigidity of the machines, which they believed would ensure close tolerance machining of tough tool steels and achieve a good surface finish to minimise hand polishing.

Machines communicate on a 10 kilometre network

By 2010, the firm had installed seven Hurco VMCs. That figure has increased to 12 in the last five years and in addition, the first 5-axis model was installed in 2012, a VMX30U. The last two machines, both VMX30Mi models, were delivered directly to the new facility in Kingswinford. All are networked with CAD/CAM systems over 10 km of cabling at the new factory.

The other side of the firm's business is subcontract machining of components around the clock in a variety of material from plastics, resin board and wax to aluminium, mild steel and stainless steel. For this type of work, conversational programming using the Win-Max software built into the Hurco controls will be used more and more to take the load off RP Tooling's CAD/CAM department.

Ultimotion, the latest Hurco control, is claimed to reduce cycle times by up to 30%. The patented, software-based look-ahead, which uses algorithms within Win-Max to evaluate the component geometry and motion profile of the cutting cycle is said to optimise and smooth the tool paths to improve performance.

Maximising productivity on the nightshift

Other software features include the work offset function, which is useful when running machines unattended overnight and at weekends. Productivity is maximised by fixturing multiple jobs on a machine table, importing the required individual programs and entering additional G-codes to tell the spindle to redatum automatically after each job has finished.

There is a six-week order book for moulds at Kingswinford and some two dozen are progressed through the toolmaking department at any one time. According to the directors, RP Tooling's main growth area is expected to be subcontract machining. It currently accounts for about 10% of turnover but the directors hope to grow this proportion to 40% over the next five years.



Source: Hurco

RP Tooling opted for Hurco due to the rigidity of the machines, which they believed would ensure close tolerance machining of tough tool steels.

» **Hurco Europe,**
High Wycombe, UK.
hurco.co.uk

Riding the waves or sliding down the mountains

Rotational mould tooling produced by UK-based Midas Pattern has facilitated the successful launch of the Fatyak Hönö, a new multi-purpose fun board designed for use on both water and snow. By Shelagh Morgan, SMPR Limited

With a history spanning 25 years, Fatyak Kayaks is a leading leisure brand and rotational moulding specialist. The company's products are designed to offer easy and affordable entry into the world of outdoor activities, and the Hönö is no exception.

Multi-purpose fun board for the ocean or mountains

"We wanted a quality, dual-purpose product, which is when we had the idea for the Hönö," explains Nick Hawkins, the company's general manager. "The Hönö is a multi-purpose fun board that allows users to body-board and knee-board in the waves, and jump on and have fun in the snow. As always, we wanted to create the best possible product with no expense spared in design and execution."

Rotationally moulded plastic parts are perfectly suited to larger, more rugged applications where strength and size are key factors. Made from tough polyethylene, the Hönö is corrosion-resistant and features the latest UV stabilisation packages to reduce colour fade and maintain strength.

The 4-kg Hönö also offers a number of other design innovations that would require careful consideration by the selected tooling manufacturer, such as deep channels on the bottom for good tracking, a batwing profile on the tail for stable turning, a moulded-in feature to secure the board-saving leash, and a drain plug location.

Although Mr Hawkins cross-checked the market by approaching other suppliers of rotational mould tooling, he says Midas has become the company's "go-to" mould tool maker. "Midas always do a fantastic job with superb quality," he states. "In addition, the tools are priced competitively and always delivered on



Source: SMPR

The Hönö is a high-end, technically superb leisure product. With this in mind, the design challenge was to find the perfect ratio between strength, weight and performance, while staying within budget.

time. I'm not just saying these things to boost their ego, these are the facts." The Hönö had to be a high-end, technically superb leisure product. With this in mind, the design challenge was to find the perfect ratio between strength, weight and performance, while staying within budget. Furthermore, the one-piece, rotationally moulded fun board had to have no seams or joints. According to Mr Hawkins, Midas "made important suggestions about how to best produce certain features".

Specialising in complex, multi-part rotational tools

Midas specialises in complex, multi-part rotational tools that include complex thread forms, loose pieces and sliding actions, for example. The company can manufacture both cast aluminium and billet-machined aluminium rotational mould tools, while surface finishes can

be polished, commercially smooth, blasted and peened.

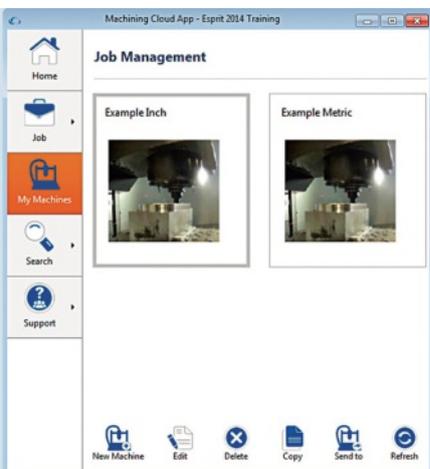
Midas tools are available to be purchased directly and used within any moulding shop, therefore offering flexibility of supply and ease of tool relocation.

The Midas tooling, manufactured in two halves, is now producing the 1200 mm x 590 mm x 100 mm (length x width x depth) Hönö boards in quantities of circa 600 a year at the Williton, UK, facility of Kingspan Environmental, of which Fatyak-Kayaks is a trading name.

According to Mr Hawkins, the Midas tooling was delivered "right first time" to Fatyak's Williton facility. The Fatyak Hönö is now on the market and "selling well" with typical annual sales anticipated at 600.

» **Midas Pattern,**
Bedford, UK.
midas-pattern.co.uk

Latest program version for PCs and tablets optimises shop productivity



Source: Kennametal

Kennametal has introduced Novo Version 1.6, its latest digital tooling data and intelligence interfaces with production, inventory, e-commerce programs available on PCs and tablets. Novo, first launched in 2013, has features in this version not available previously.

According to the company, on entering basic information regarding a shop's machine tools, such as hourly cost, maximum spindle-

speed and torque, a new "My Machines" button will take Novo tooling recommendations and optimise them for specific machine conditions. Such virtual machine libraries can also be shared across multiple users.

New to V1.6 is a turning cut-off advisor, Kennametal adds. This function searches for cut-off applications, and Novo's rules-based engine will return and rank the most appropriate cut-off

tool based on the job conditions. Additionally, V1.6 has a customer part-number capability. Many customers use their own nomenclature, and once this cross-reference is entered and initially populated, it will be stored and visible whenever Novo is used, making it easy to connect tool selection to a customer's internal systems.

» **Kennametal**, Fort Mill, USA.
kennametal.com

5-axis VMC uses rigidity to maximise use of power available

The highly rigid, tilting-head design of the Wele UA 2590 5-axis vertical machining centre (VMC) is able to maximise material removal with 4,950 Nm of torque available from the drive to the swivelling A-axis head, complemented by 7,960 Nm in the rotational B-axis, the supplier says. Both axes have +/- 40° of movement.

In addition, to maximise machining efficiency, the table is supported by a highly

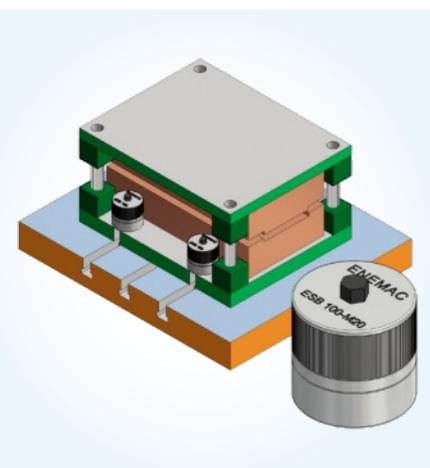
rigid, solid Meehanite cast base carrying four hardened and ground boxway slide units and the Y-axis travel powered via a dual-drive feed system. As a result, this is said to significantly increase the levels of rigidity and accuracy while minimising the onset of vibration under heavy machining or interrupted sequences.

» **2D CNC Machinery**, Hinckley, UK. 2dcnc.co.uk



Source: Wele

Power clamping nut for fast and easy clamping of large workpieces



Source: Enemac

Enemac's power clamping nut, ESB, with its integrated planetary gear is said to be able to be driven easily by a small nut outside the housing, so that the internal thread is a little retracted to allow the tightening of the counterpart. The company says this principle is simple, with a large effect enabling the user to manually operate a force of 6 to 20 t.

According to Enemac, the power clamping nut is first

screwed onto the existing bolt, then rotated at the top-mounted nut with a standard torque wrench or even with a normal socket wrench, until the specified tightening torque and the power clamping nut are securely tightened to the workpiece or tool.

The ESB series is ideal for large work pieces or tools as the depth of the screw is limited by the blind hole. The series is available for

thread-sizes M12 to M64. Special threads are offered on request. A high-temperature version is available for power clamping nuts that are exposed to extreme heat, like in foundries or ceramics manufacture. The clamping nuts can be used either as original parts or as a retrofit item, the supplier adds.

» **Enemac**, Kleinwallstadt, Germany.
enemac.de

Quick-change jaw system now available with master and quick-change steel jaws

Kurt Workholding has introduced a 6-inch steel Dovelock quick-change jaw system for its standard 6-inch vices and towers. The company is expanding its Dovelock line with master and quick-change steel jaws for machinists who prefer steel jaws.

According to Kurt, the Dovelock quick-change jaw system enables fast jaw changes and repositioning with high precision. They are machined from 4140 pre-hard steel to ensure precise and repeatable set-ups with 90% reduced jaw change time to less than a minute and jaw positioning repeatability of up to ± 0.001 . Exclusive to the Dovelock, the machinable jaws can be rotated 180° and machined on



Source: Kurt

both sides for two different part set-ups.

The company has also introduced the new steel-hard jaw set. These are extra-slim steel jaws for the Dovelock jaw system that add just 1/4" to each master jaw. They allow the Dovelock jaws to be

used as a hard jaw in set-ups that do not require custom-machined jaws. The steel jaw set can also be rotated 180° for higher part positioning, the company notes.

Furthermore, the Dovelock master jaw uses dovetail quick-clamps to precisely

hold the quick-change jaws. The master jaw is attached to the stationary and movable jaw of any standard 6" Kurt standard vices or Kurt Cluster Tower in the initial set-up. Once installed, the jaws can be changed by loosening the three quick-clamps on top of the master jaw; the jaw is then removed by pulling it out forward or sliding it out of the side of the master jaw, Kurt explains.

The steel Dovelock quick-change jaw system consists of a jaw set of two steel master jaws, four low head socket cap screws and a 5/32" hex "T" wrench.

» **Kurt Workholding,**
Minneapolis, USA.
kurtworkholding.com

Mobile extraction and filter unit for welding stations with contamination-free dust disposal system

Maxifil Clean from Kemper is a mobile extraction and filter unit with cleanable filter. The unit is said to ensure effective collection of pollutants at their point of origin and is patent-pending for its unique contamination-free dust disposal system in cartridges. Initial use of Maxifil in plants has already been met with a positive reaction, according to the company.

The unit is said to be easy to handle and can be put to use at different welding stations. Moreover, its flexible extraction arm allows it to be used in different positions. The arm is available in lengths of up to 4 m. Its size and the shape of the extraction hood allows for the collection of up to 40% more welding fumes than conven-

tional extraction hoods. Its extraction hood can be rotated 360°. The arm is self-supporting and remains in the position it is placed in, Kemper explains.

Additionally, Maxifil is suitable for permanent use where large volumes of

welding fumes occur. This is possible as the cleanable filter is integrated as a cartridge. It has an area of 15 m² and cleans itself automatically during operation, allowing over 99.97% of the welding fumes that contain respirable dust of less than

10 µm to be removed, the company says. After filtering, the unit automatically feeds the dust particles to an easy-to-seal disposable cartridge. Thus, users do not come into contact with the pollutant particles.

The company notes that the unit can be used when welding chrome-nickel steels. An integrated spark pre-separator prevents large dust particles and sparks from finding their way into the filter, thus extending its service life. Automated starting and stopping as well as an LED lamp can be optionally integrated into the extraction hood.

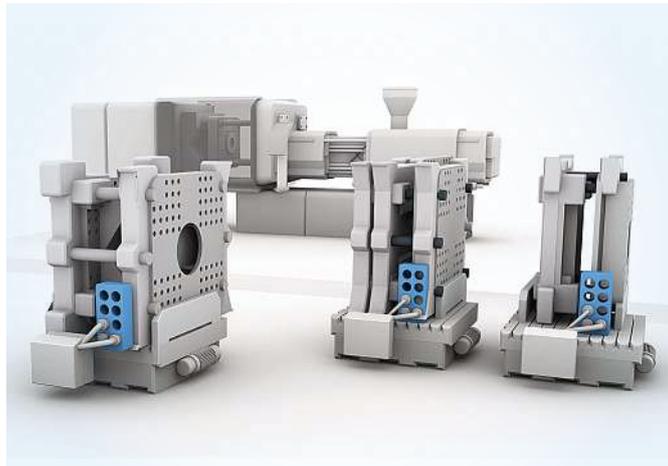


Source: Kemper

» **Kemper,**
Vreden, Germany.
kemper.eu

Tracing injection moulds via RFID provides transparency in mould handling

Moulds from injection moulding machines are subject to wear and tear and must be regularly maintained as a result. The regularity of inspection often depends on the experience values of individual employees or handwritten notes. However, these are not always accessible, Balluff explains. Therefore, in many cases, maintenance and inspections are frequently carried out only if the produced components no longer meet the required standards or if the mould malfunctions. This results in unscheduled stoppages that waste plenty of time and money. This is where Mold-ID from Balluff comes in. It supports condition-based maintenance and provides more transparency



Source: Balluff

in mould handling, the company says. It explains that by means of industrial RFID, Mold-ID makes the use of injection moulds traceable and ensures their optimal utilisation. Mold-ID is backed by an autonomous system that

can be retrofitted anywhere and at any time on all machines, without the need for the manufacturer or intervention in the controller.

In addition to the mould identity, a rugged RFID data carrier at each mould stores the current shot count and

various mould-specific process parameters in non-volatile memory without making contact. This data can be called up via a smartphone or a mobile RFID reader at any time (for an audit, for example). An externally attached inductive or optical sensor, which is mounted at a suitable place on the machine, serves as the shot counter. According to Balluff, both not only ensure that assignment of the moulds is unmistakable, but they also return the objective database for condition-based maintenance. This is said to extend the service lives, improve reliability.

» **Balluff**,
Neuhausen, Germany.
balluff.de

Porcupine cutter and splitter inserts for rough operations and better performance

Korea-based Taegutec has expanded its Mill-Rush line by adding extended flute cutters, also known as “porcupine” or “long-edge” cutters, and splitter inserts to improve performance on roughing operations, the company says.

Extended flute end mills and shell mill cutters are being added to the 3PKT 06, 10, 15 and 19 mm insert line. For tool machining depth, the last two are also added to the Mill-Rush line.

All Mill-Rush inserts can be clamped to extended flute end mills and shell mill cutters. Also, the 3PKT 15 and 19 mm inserts are available with three corners and two grooves, and three corners, three grooves with a different colour periphery,

respectively, namely the SM2 and SM3. Both do not miss matches after machining and offer a lower cutting load and less vibration, the company notes.

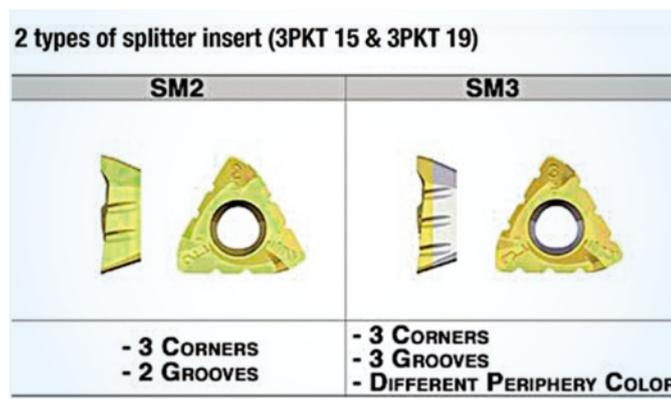
Furthermore, for the splitter inserts, even number teeth cutters are available as standard items. The inserts are covered with the compa-

ny’s Gold-Rush coating that is said to offer improved toughness and wear-resistance, and reduced friction to chip-flow while providing workpiece surface finish.

According to Taegutec, the APKT and ANHX splitter insert types can perform under unstable machining conditions such as long

overhang or weak fixtures as grooves on the cutting edge reduce the cutting load, vibration and noise. Furthermore, the Mill-Rush porcupine cutter is said to increase metal removal rates and is used for machining rough edges or deep shoulders.

The supplier claims that a case study noted its porcupine cutter with splitter inserts increased tool life by 39% while machining a workpiece made from construction steel. In another case study conducted on cast iron, Taegutec’s extended flute cutter with splitter inserts reportedly outlasted a competitor’s tool by 50%.



Source: Taegutec

» **Taegutec**,
Dalseong-Gun, Korea.
www.taegutec.com

Vertical machining centre offers high accuracy

Mitsui Seiki has added to its Vertex 550-5X line of machines new features, options and configurations within the series, said to offer enhanced accuracy and precision. This new series, comprising six models, includes the company's Vertex 55X II. Its linear axes strokes are (X, Y, Z) 550 mm x 600 mm x 500 mm.

According to Mitsui Seiki, 15,000, 25,000 and 30,000 rpm spindles are available in the Vertex 55X II, with the option of a HSK-80 taper spindle connection for heavy-duty machining. The machine line includes configurations based on table sizes with a diameter from

225 to 400 mm. A choice of rotary axis drive system – high torque geared type or direct drive – allows for optimum machine configuration, Mitsui notes.

Additionally, this line is available in a B-series version, that has a high speed 5-axis VMC for turbine blade production, used in aerospace and energy industries. High performance coolant and chip handling systems are available. Automation devices and systems can be integrated for on-machine inspection and work handling to reduce set-up time.

The Vertex 55X II geometric accuracy is monitored in temperature-controlled factory environments. The machine features a cast iron bed and its box-in-box design offers rigidity. Guide-way mounting surfaces are hand-scraped to achieve volumetric accuracies, superior to simply machined or ground systems, Mitsui says.

» **Mitsui Seiki,**
Franklin Lakes, USA.
mitsuiseiki.com



Source: Mitsui Seiki

Software for online simulation checks interferences

CNC simulation and verification software provider Machineworks has been working with Goodway Machine Corporation to develop advanced full machine simulation online. Having completed a very successful integration of Machineworks libraries, Goodway has made full machine simulation available on its FANUC controllers, the company reports. It is now available on a range of machine models including the GTZ-2600, GTH-2600, GS-4000, GV-100 & -1200, SW-32 & -20.

Goodway signed up for Machineworks looking to offer its customers the ability to simulate material removal in the full machine environment as well as to check for interferences.

Thanks to the new functionality Goodway's customers can reportedly achieve high-quality 3D animation simulating machining.

Collision avoidance and simulation functions are said to save preparation time and enhance overall safety of the process. The company also provides libraries for the



Source: Machineworks

new SVI (Simulation-Verification-Interference) software for PCs. Moreover, it offers off-line machine simulation, program verification and interference checking before operating in the real machine.

According to Machineworks, the Goodway G. LINC350 is leading the way and has achieved some of the most advanced 3D graphics benefiting from its innovative and reliable software. Goodway is reportedly now making very efficient use of multiple core processing power thanks to the multi-threaded libraries.

» **Machineworks,**
Sheffield, UK.
www.machineworks.com

Quick-change chuck for lathes with short-stroke cylinder saves time, ideal for first-time users

Schunk has launched the Rota NCX quick-change chuck for lathes with short-stroke cylinders. According to Schunk, the NCX can replace conventional lathe chucks without a quick-change jaw system without any conversions. This is said to minimise set-up time, while extending machine running times. A new jaw set can be retrofitted with an accuracy of 0.02 mm within 60 seconds, the supplier says

and adds that the NCX is suitable for finish-machining as well as high-volume production.

To ensure operational safety the NCX is equipped with a jaw locking system and jaw presence monitoring. With an individual base jaw system, the Rota NCX becomes particularly appealing for users that do not yet work with a quick-change jaw chuck. Moreover, all standard top jaws with

tongue and grooves can be used as top jaws, Schunk says. The NCX is available in sizes 165, 215, 260, and 315 mm with a through-hole diameter measuring 53 mm to 106 mm, a jaw stroke of 3 to 6.3 mm, and a clamping force of 55 to 155 kN. The unit can also be used for I.D. and O.D. clamping.

» **Schunk GmbH & Co. KG,**
Lauffen/Neckar, Germany.
www.schunk.com

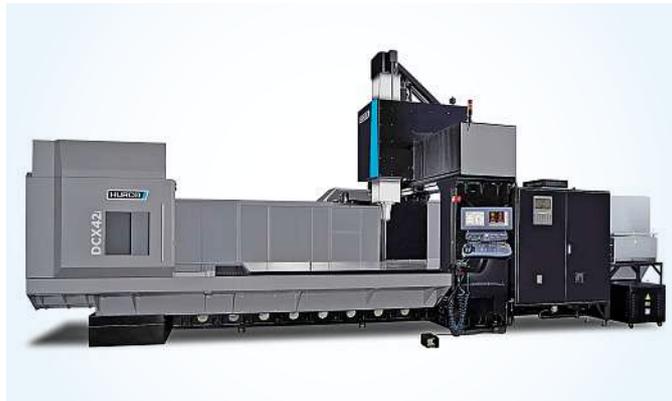


Source: Schunk

Machining centre range allows heavy loads up to 16 tonnes, offers high accuracy

Hurco has now added a third, larger model, the DCX42i, to its twin-column, bridge-type, vertical-spindle machining centres introduced in 2009. The 51-tonne machine has a 4.2 m X-axis travel, 2.6 m in Y and 1.1 m in Z, providing a working volume nearly double that of the previous model, the DCX32i, the company says.

According to Hurco, a major advantage of the design over a traditional C-frame is that a much larger Y-axis travel can be achieved without the loss of rigidity. It is also said to offer thermal stability for higher accuracy machining and allows heavier table loads, so large components can be produced to tight tolerances.



Source: Hurco

One component of up to 16 t can be carried on the table of the DCX42i, Hurco notes and explains that the massive cast-iron structure was designed using finite element analysis. Furthermore, the 60 kW spindle, mounted in a vertical ram of box-construction, provides a

maximum speed of 6,000 or 10,000 rpm. It is oil/air-cooled and can deliver up to 570 Nm of torque. The tool magazine features 40 stations for BT50 tool holders and a swing-arm tool changer keeps the carousel clear of swarf to maximise the working envelope.

According to Hurco, all DCX machines are fitted with the Hurco Win-Max twin-screen control. Standard features of the control include simple conversational programming, full industry standard NC capabilities and a 64 GB hard drive. Ultimotion, the high-speed profiling software, reduces cycle times by up to 30%, the company claims.

The flexibility of the control also ensures that any job can be programmed easily and quickly, Hurco adds. Options include web-based networking to allow remote machine surveillance.

» **Hurco Europe,**
High Wycombe, UK.
hurco.co.uk

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Next Issue

EUROPEAN TOOL & MOULD MAKING

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JUNE ISSUE PREVIEW

Next month, **ETMM** will focus on tool and mould materials and components with articles on the latest products and developments, as well as our Quick-Sourcing Grids.

The June issue will also include:

- » News and products from the Control show and the inaugural Moulding-Expo in Stuttgart.
- » An industry supplier interview.
- » A special feature on tool and mould making in Russia.
- » The technology section will focus on cutting tools and machining equipment.
- » The latest edition of EDM Europe, our quarterly supplement.



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MASTHEAD

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