

How AM is helping diesel engines run cleaner » Page 16

Growth and consolidation: the AM industry after COVID-19 » Page 13

Inspired by the potter wasp: 3D printers for houses and more » Page 24

by formnext



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EDITORIAL

s those involved in additive manufacturing know only too well, being a first mover isn't always easy. After all, it wasn't that long ago that most people thought printing was limited to paper. It took a few visionaries to bring the process into the third dimension.

So far, not all the myriad possibilities imagined in 3D printing back then have come true. The road from the garage to industrial serial production has proven rocky and fraught with obstacles. Replicability, process stability, quality assurance, standardization, material properties, and patent rights are just a few of the challenges the sector continues to face. That's why first movers in our field need courage, foresight, patience, a willingness to invest, and a firm belief that success is just around the corner.

While that day never actually arrives for many, some pioneers of 3D printing have managed to stake out positions in industrial additive manufacturing. At the same time, much of what was once just a vision has indeed become reality, and there's no doubt in my mind that AM will continue to write a compelling success story.

With Formnext, we've been making plenty of moves of our own — and overcoming a number of hurdles along the way. Following the shutdown of the entire trade fair sector due to COVID-19, we're currently climbing back out of the most difficult situation we've dealt with yet.

Formnext 2021 is now nearly upon us, and we've made the bold decision to welcome our customers back to Frankfurt on 16–19 November for a live event that will be held in compliance with the highest safety requirements. This means we'll be one of the

first trade fair organizers to grant access only to those who are vaccinated or have recovered from COVID-19 based on the coronavirus ordinance enacted by the State of Hesse. Unfortunately, a negative test will not be sufficient.

This will enable us to protect our customers and unvaccinated individuals while still providing for the outstanding event and quality interactions you've come to expect from Formnext. In other words, you won't have to worry about things like social distancing, one-way foot traffic, protective screens, or a lack of catering. Our exhibitors and attendees will thus be able to focus on what's important: coming together in a safe environment to delve into the latest topics face to face and seal deals with a good old-fashioned handshake.

I hope you're looking forward to the next big gathering of the AM community as much as I am!

U. Walle

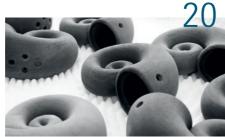
Sincerely, Sascha F. Wenzler Vice President Formnext



This edition of Formnext Magazine includes an insert from Germany Trade and Invest, the country's economic development agency.

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FORMNEXT NEWS



STANDARDS, MOON HABITATS, AND PROSTHESES FOR DOGS

long with everything from innovative business ideas and designs to exciting applications in construction and mechanical engineering, this year's Formnext will offer a first-rate program of live events, some of which will be continued and supplemented at the Digital Days. For example, the winners of the Start-up Challenge and the finalists in the purmundus challenge will be presenting themselves. On 16 November 2021, the participants of the Start-up Area will show you why it is worth investing in them. Visitors can also learn about current additive developments from the construction industry at the BE-AM special exhibition and the BE-AM symposium. In addition, interesting AM applications from the world of mechanical engineering will be showcased by the VDMA working group AG AM in its own special area. And finally, the Standards Forum on 15 November will show how AM applications can be industrialized even better in the future. The latest AM developments from industry and research as well as exciting applications from various sectors will be presented at the TCT Conference @ Formnext as well as at the TCT Introducing Stage @ Formnext.

BE-AM SPECIAL EXHIBITORS AND SYMPOSIUM

Led by scientists from the Technical University of Darmstadt, BE-AM | Built Environment Additive Manufacturing covers a spectrum that ranges from architecture and civil engineering to manufacturing automation. At the BE-AM special exhibition at Formnext and the BE-AM symposium scheduled for the Formnext Digital Days, exhibitors and speakers will highlight and discuss the work of 11 well-known companies, nine universities, and two research institutions. The developments on the agenda will include 3D-printed habitats on the moon, houses, bridges, and street furniture.

PURMUNDUS CHALLENGE

Under the motto »Innovation in progress«, the Purmundus Challenge shines a spotlight on forward-thinking, end-to-end solutions from 12 countries across five continents. Their exciting exhibits will offer insights into future applications of additive manufacturing, from concrete shading of buildings to a kinematic chair and prostheses for dogs.

STANDARDS FORUM

Formnext's standards forum is a workshop dedicated to discussing standardization needs in additive manufacturing. In 2021, its theme will be »Industrialization of AM Through Standardization: How Can We Take AM to the Next Level?« This one-day workshop will help attendees understand how standards impact the industrialization of AM and how they can leverage standards for various AM applications across different industry sectors. Scheduled to be held in Frankfurt on Monday, 15 November in conjunction with Formnext, the event is being jointly organized by ASTM International, the US Commercial Service, and ISO.

START-UP CHALLENGE

This is already the seventh year in which the international Formnext Start-up Challenge is recognizing young companies from the world of additive manufacturing for their innovative business ideas and technical developments. For 2021, the winning entries range from nanoscale AM and 3D printing with glass to new medical solutions for spinal patients. They will be presented at Formnext by their respective creators, who hail from all around the world.

VDMA SPECIAL AREA

The Additive Manufacturing Working Group of the VDMA will join around 170 member companies of this German industry association in a special area at Formnext in Hall 12.0. There, they plan to present examples of successful applications and developments in AM and related aspects of industrial 3D printing. Tools, machine components, and prototypes will demonstrate the many advantages that result from these new manufacturing processes. In addition, the working group will present current topics such as process chains and the OPC Unified Architecture at its booth.



FURTHER INFORMATION:

» formnext.com

Photo: Formnext / Mathias Kutt

EXHIBITOR NEWS

06

3D-PRINTING SILVER COINS IN SERIES

rinty will be presenting a prototype of the first serially produced, 3D-printed silver coin for collectors. In cooperation with Pressburg Mint, a company specializing in the traditional minting of numismatic and investment coins, the Slovak company has developed an additive production process for the mediumvolume mintage of silver collectors' coins using binder jetting.

Since high-relief coins are very difficult to mint using traditional techniques, they are highly valued by collectors. Unlike traditional minting in a hydraulic press, complex coins like these can be produced relatively easily using additive manufacturing. That's why Printy has developed a coin design with an extremely high relief and overhangs that would not be possible to manufacture using traditional minting processes. »After defining our final goal in a digital render, we began to search for the right additive technique, « says Radoslav Behul, CEO of Printy. The main requirements were the capability to produce sufficient volumes and good surface quality. Based on these two criteria, binder jetting was identified as a good candidate. »In partnership with ExOne, we conducted several trials using sterling silver, « Behul continues. After some fine-tuning, the first prototype was printed and sintered. »The surface was what we call an antique finish. This would be fine for many coin designs, but to achieve the envisaged mirror-finish surface, different post-processing was necessary.« The final post-processing was done in partnership with GPAinnova and its

DLyte machine. The last step consisted of embedding blue diamonds to achieve the anticipated design. The reverse side of the coin will include the effigy of the issuing country and a nominal value that will be revealed when the coin is launched in 2022.



Printy at Formnext 2021 Hall 12.0 / Booth A133

BETTER SEATING ON LATTICE DESIGNS AND FOAM STRUCTURES





ASF 3D Printing Solutions is presenting a 3D-printed bicycle saddle that supports mass customization and which has been developed in collaboration with Hyperganic. In doing so, BASF wants to present the next generation of sports equipment – one that pairs high-performance products with individual comfort.

Although 3D-printed bicycle saddles have been on the market for several years, BASF says there has been no scalable workflow for serial customization until now. Along with Hyperganic, atum3D, and Innovationlab, it has now realized the idea of moving from individual 3D pressure maps to market-ready bicycle saddles in a fully automated workflow.

The starting point of the project was the cyclist's body, which was accurately reproduced using an InnovationLab sensor. The individual structure and the exact pressure intensities of the seat bones were translated into digital information. In order to generate a customized bicycle saddle based on the cyclist's individual data, Hyperganic developed a specific application: Hyperganic Core, which makes it possible to algorithmically generate

the fine struts that make up a saddle's grid structures and adapt them individually to the cyclist's sitting bone structure. The geometries, volumes, and lattices are automatically modulated according to the 3D pressure map entered. This automates a process that was previously manual, and therefore time-consuming.

In addition to a variety of lattice designs and different foam structures that suit the sporting demands of the cyclist in question, an aesthetic outer lattice structure can also be individually selected. Performance demands and an individual fit can thus be effortlessly combined.

However, the saddles produced at the end of the algorithmic design process are objects that are so complex and multi-layered that they can only be manufactured additively. For the material, the choice fell on the reactive urethane photopolymer Ultracur3D EL 150 from BASF 3D Printing Solutions. The saddles were produced by atum3D using a DLP Station 5-365

BASF 3D Printing Solutions GmbH at Formnext 2021: Hall 12.0 / Booth D59

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EXHIBITOR NEWS

PUTTING STUDENTS ON THE PATH TO 3D PRINTING

he non-profit project »3D-Druck macht Schule« provides schools throughout Germany with a specially compiled kit for building a functional, school-safe, and expandable 3D printer. It also gives students comprehensive instructions on setting up 3D printers of their own

Originally based on the Anet A8 and expanded with various additional parts (as well as 3D-printed add-ons), a complete set of over 100 individual components has been created.

The initiative aims to promote interest in technology among schoolchildren. Its practical orientation represents a change from the familiar teaching model and opens up a new pedagogical approach that both exposes students to technology and involves them in the creation process. Students learn not only to use technology, but also to understand it, improve it, and integrate its working methods into new processes on their own. The issue of safety is enormously important — especially

at schools, for both students and teachers. For this reason, the »3D-Druck macht Schule« printer received the V3 seal for electrical systems and equipment from the German insurance association DGUV based on its safety enhancements, which means it is certified as safe for use in schools.

Berlin Partner at Formnext 2021 Hall 12.1 / Booth F41

A NEW WAY OF CUSHIONING

hairs have been used to increase comfort for thousands of years. Whereas a simple wooden structure generally did the job in the early years, the concept has since evolved into a vast product field for a variety of purposes, including comfort, functionality, and design. Even though the perception of these three aspects has quite changed over time, the materials have remained mostly the same: wood, metal, foam, and fabric. Lately, however, demand has been growing for new solutions.

After setting out with the goal to build a perfect seat, the team at Oechsler AG realized that the furniture market had been sticking to similar materials for years. An additional analysis of usual production processes led to deep insights into how seating applications are constructed and manufactured. Armed with this knowledge, the team aimed to create a product that would not be a single futuristic copy, but a real alternative to previous seating.

Oechsler assigned the design portion of the project to a partner with corresponding expertise, namely Steinbauer Design. The main goal was to use as few materials as possible and achieve the highest flexibility in terms of design and functionality. The design approach aimed to reduce the parts used in conventional lounge chairs as much as possible by combining soft and hard parts into one component. Using lattice technology, Oechsler achieved these special properties

and also printed the connection elements between the seat and chair feet using BASF's Ultrasint TPU01 on a HP Jet Fusion 5210 3D printing solution.

PRINTED PARTS AS A SUBSTITUTION FOR RACKS

The comfort of any sitting furniture depends on two main factors: the design and the cushioning. Endless combinations of different lattice sizes, thicknesses, and forms allow any degree of the latter variable.

With the help of additive manufacturing, fabrics, springs, and foam layers can be eliminated without losing comfort. To stabilize parts of the seating, rigid printed parts serve as a substitution for racks. The 3D-printed product can also act as a base for further processing. By adding other printed components, racks, or textiles, for example, its appearance can easily be changed, offering a whole new variety of design perspectives.

By printing rigid and soft parts as one structure, Oechsler created the hybrid chair »Slope« with ergonomic and comfortable cushioning. An optional textile cover can simply be attached to the top. Moreover, the chair is very easy to disassemble and transport due to its light weight.

Oechsler at Formnext 2021 Hall 12.0 / Booth B62





Photos: Oechsler, Creatorspace

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EXHIBITOR NEWS

3D-PRINTED INJECTION MOLDS THAT SIMPLY MELT AWAY

enmark's Addifab, a self-described pioneer in 3D-printed tooling, will be joined by Mitsubishi Chemical and Dr. Boywill at Formnext 2021 in showcasing the transformative speed, cost savings, and sustainability benefits that are achievable with free-form injection molding. The innovations to

be demonstrated range from medical devices to classic lattice structures. According to Addifab, free-form injection molding makes it possible to 3D-print injection molds, inject their cavities with the desired material, and then dissolve the molds, leaving only flawless final parts or products. This process produces testable results with up to 75% lower carbon emissions than conventional tooling, and it can also reduce the time and costs required by up to 88%.

Addifab at Formnext 2021 Hall 12.1 / Booth F52

RIDING AM TO OLYMPIC GOLD

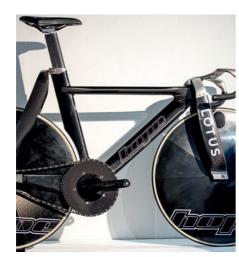
enishaw, has used its expertise in additive manufacturing (AM) to help produce an innovative new track bike for the Great Britain Cycling Team (GBCT), that contributed to seven medals at the Tokyo Olympics. The HB.T improves on previous designs by using a lightweight build to reduce drag and improve overall speed. As an Official Supplier of the Great Britain Cycling Team, Renishaw will also be providing ongoing support to the team as part of a longer-term partnership.

Lotus Engineering, designers of the iconic 108 and 110 bikes ridden by Olympic gold medallist Chris Boardman in the 1990s, collaborated with cycling component manufacturer Hope Technology to build the HB.T. In early 2019, Renishaw was approached by British Cycling - national governing body for cycling in Great Britain - to join the development team due to its additive manufacturing (AM) expertise, recognising that metal 3D printing could build lighter, more complex components than traditional manufacturing methods.

Renishaw initially used its AM expertise to rapidly produce plastic and metal prototype parts to undertake aerodynamic testing of the new design and ensure that parts were light, geometrically correct and strong enough to endure the strain from riders. After proof of concept, the company then used its own RenAM 5000 AM systems to manufacture aluminium and titanium parts, including handle-

bars, for the competition bikes, with parts customised for individual athletes.

At Tokyo 2020, the HB.T bikes also helped to make British Olympic history. Laura Kenny became the most successful British female Olympian of all time after winning a gold medal in the Madison with Katie Archibald, and silver medal in the women's team pursuit. Jason Kenny also became Britain's most successful Olympian ever, winning Gold in the men's keirin and silver in the men's team sprint.



Renishaw at Formnext 202' Hall 12.0 / Booth C139

PRINTING CASTING MOLDS WEIGHING UP TO 60 TONS



n a new research partnership, GE, Fraunhofer IGCV, and voxeljet AG plan to develop the world's largest 3D printer for offshore wind turbines. Their specific goal is to optimize the production of major components of GE's Haliade-X offshore wind turbine.

Currently under development, the Advance Casting Cell (ACC) 3D printer will be subsidized through the German Federal Ministry for Economic Affairs and Energy and able to print molds for cast components that will be installed inside the GE Haliade-X nacelle. The aim is to reduce the production time for the molds, which weigh up to 60 tons, from 10 weeks to just two. The project will start in the third quarter of 2021, and the first print tests are planned for the first quarter of 2022.

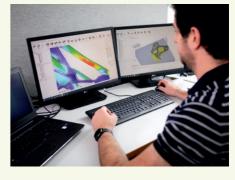
The project includes the development of a new, large-format 3D printer for the additive manufacturing of sand molds, which are to be used in casting highly complex metal components that are installed inside offshore wind turbine nacelles. Based on voxeljet's binder jetting technology, the modular 3D printing process involved can be configured to print molds that span up to 9.5 meters in diameter and weigh more than 60 tons. »While on-demand 3D printing offers many advantages for small-volume castings, an on-site 3D printing system can fully unleash the technology's potential, « says Dr. Ingo Ederer, CEO of voxeljet.

The International Energy Agency predicts that offshore wind turbine capacity will increase 15-fold by 2040, which would make it a \$1 trillion industry.

Voxeljet at Formnext 2021 Hall 12.1 / Booth C129

DIGITAL PATHS FOR LEARNING ADDITIVE SKILLS

The Additive Minds Academy is training tomorrow's AM experts for the surrounding industry







ndustrial 3D printing offers companies tremendous potential in the development of new applications. However, the ability to acquire related expertise quickly is key — particularly for those new to the field. This is why the Additive Minds Academy has set its sights on developing innovative learning formats that are designed to impart practically oriented knowledge of industrial AM.

For EOS, a world-leading technology provider in the industrial 3D printing of metal and plastic, the academy's learning programs are part of an ongoing effort to expand its offerings in the areas of training and knowledge transfer, which the company plans to present for the first time at Formnext 2021.

It was back in 2016 that EOS founded its Additive Minds consulting unit, which aids companies in realizing the promise of industrial 3D printing. The Additive Minds Academy has now been combining its extensive experience in consulting and technical training into new learning environments since 2020. In the process, it is also focusing on sustainability: With its digital learning formats, the academy is working toward preserving resources and reducing the time and costs involved in travel.

ASSEMBLING EFFECTIVE AM TEAMS

The Additive Minds Academy's portfolio includes bite-size learning content, online courses, workshops, and extensive learning paths. Its training programs are designed to prepare learners for various challenges in AM and roles ran-

ging from machine operator and application specialist to AM product designer and production supervisor.

The learning paths, which cover fundamental knowledge in various areas of technology, enable companies to train up highly capable teams that have all the skills required in additive manufacturing. Participants can gain an elementary understanding of the technology involved, proper component selection, AM-compatible designs, and even the scaling and validation of production.

In this way, the paths make it possible to acquire the skills necessary for a new role in the space of four to six weeks. The compact courses involved combine electronic forms of learning with practical applications based on relevant case studies. Furthermore, participants receive feedback and continuous support, as well as the option to interact with their instructors and peers. Upon passing a final exam, they are presented with an Additive Minds Academy certificate.

LEARNING ON THE CUTTING EDGE

To provide knowledge precisely where it's needed, the Additive Minds Academy is also developing apps that offer an immersive learning experience. On the topic of machine installation, for instance, it uses an app it created along with the software provider netTrek that has since received the 2021 eLearning Award (in the »Augmented Reality« category) from eLearning Journal. The app provides assistance in commissio-

ning and maintaining industrial 3D printers by displaying three-dimensional learning content to machine operators in real time, which enables them to fix errors with the help of live guidance.

EOS and Additive Minds Academy at Formnext 2021 Hall 12.1 / Booth D01

All the online training available from the Additive Minds Academy can be found in the EOS Store at store.eos.info/collections/training.



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EXHIBITOR NEWS

3D PRINTING, WELDING, DRILLING, AND CUTTING IN ONE MACHINE

rima Additive is bringing several exciting new developments to Formnext 2021. The Print Genius 150 Double Wavelength, for example, is the new powder bed fusion product in Prima Additive's 150 series. The machine is equipped with an innovative configuration of laser sources, which include a 300-W infrared laser and a 200-W green laser that can work alternately on the same work area.

According to Prima Additive, this makes it possible to select the best wavelength for optimizing the material's absorption of laser radiation. For instance, you can choose IR radiation for steel alloys, titanium, nickel, or chromium-cobalt, or green radiation for pure copper, aluminum, or other highly reflective materials. The Print Genius 150 Double Wavelength features a build volume with a diameter of 150 mm and a height of 160 mm.

Another solution on display at the Prima Additive booth will be the Print Genius 250, the ideal solution for high productivity metal printing applications. It is capable of reducing production times thanks to its 500-W singlemode dual laser, which combines with intelligent software to enable quick orientation of pieces and the definition of machine parame-

ters. Its build volume (258 x 258 x 350 mm) makes the machine suitable for the production of medium-sized components.

The latest Prima Additive development for direct energy deposition additive manufacturing processes, the Laserdyne 811 DED, will also be showcased in Frankfurt. The Laserdyne 811 DED is an extremely flexible solution that makes it possible to 3D-print, weld, drill, and cut 3D and 2D components with a single machine. With its BeamDirector and quick-change nozzles, the machine can be made suitable for the application at hand in a matter of seconds. The Laserdyne 811 DED also features a working

of 1100 x 800 x 600 mm. The machine can be equipped with a REAL_DED (REal-time Adaptive Laser beam for Direct Energy Deposition) laser deposition head, which was developed and patented by Prima Additive to increase the performance and efficiency of the deposition process and let the end user adapt the laser beam spot dimensions in real time during the process.

Prima Additive at Formnext 2021 Hall 11.0 / Booth D21





LASER DEPOSITION WELDING WITH PROCESS MONITORING



he Chiron Group will present the AM Cube at Formnext 2021. This 3D metal printer has already proven itself in industrial use and has a variety of additional options. Attendees will be able to experience two new components in the Chiron Group's interactive showroom: DataLine AM and VisioLine AM (see further details below).

In order to specifically analyze and optimize the laser deposition welding process, two new digital systems are now available for the AM Cube. With DataLine AM, all relevant process data can be continuously displayed, recorded, and documented live, which makes it possible to reliably assess product and process quality. VisioLine AM, meanwhile, captures and stores video files via several camera systems (e.g. a melt bath camera, a thermal camera, a workpiece camera, and a workspace camera) to provide for systematic process monitoring.

At Formnext, Chiron will also be demonstrating the optimal interaction of additive manufacturing and machining in an exciting use case. There will be a preview of its second innovation project, as well: AM Coating involves a system for applying extremely hard coatings to brake discs and rotationally symmetrical components.

Chiron at Formnext 2021 Hall 12.0 / Booth A41

GROWTH AND CONSOLIDATION

fter suffering quite a shock due to COVID-19, broad sections of the AM market are now getting back on track. Things can be quite different depending on the region, industry, or technology you look at, however.

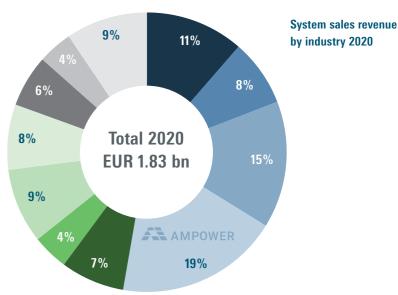
This year, the AM industry seems to be shaking off the effects of the pandemic for the most part, heralding a return to its usual annual growth rate of around 20 percent. That said, it's important to be aware of how the recent developments vary by region, industry segment, and technology.

In geographical terms, the trends are the same as in years past: The United States, which remains the world's largest AM market by far, also boasts the highest growth rates. China and Germany rank second and third, respectively, with somewhat lower rates of growth. Although the US industry entered the metal AM market quite a bit later and many companies still have a lot of catching up to do, an impressive number of new firms are emerging across the pond. A large portion of these start-ups and the vast majority of corresponding global investments are currently connected to US-based suppliers and users of additive manufacturing.

RECOVERY IN AUTOMOTIVE, METEORIC GROWTH IN AEROSPACE

Medical technology, aviation, and vehicle manufacturing have historically been the biggest target markets for AM systems, materials, and production services (see graphic). The development of the latter two sectors played a particularly prominent role in the AM industry's plunging revenues in 2020, and the negative effects will be felt in aviation for some time to come. This field is expected to need several years to recover, along with the support of investments from the military sector in particular (in aircraft engines, for example).

While the vehicle production industry has rebounded much more quickly, it is becoming increasingly clear that direct AM applications are still the exclusive domain of the sportscar and luxury segment. At the same time, additive



Automotive, Motorsports, Trucks, Buses

EXHIBITOR NEWS

- Civil Aviation, Turbines, Helicopters
- Defense, Space
- Medical
- Dental
- Energy, Powerplants, Oil and Gas
- MechEngineering, Automation, Robotics
- Tooling, Moulding
- Research Institutions
- Consumer Goods
- Othe

techniques have well and truly arrived in the areas of tools, means of production, and pilot runs — and plenty of potential still remains untapped. Aerospace is another area that has returned to the high rate of growth it had been enjoying in recent years in metal 3D printing. Increased demand is projected going forward, as well, especially in connection with large installations capable of building things like more powerful rocket engines of a single piece from high-performance materials.

SUPPLIER SATURATION IN ESTABLISHED PROCESSES

When one takes a closer look at the various technology segments in AM, two seemingly contradictory trends — growth and consolidation — become increasingly apparent. An oversaturation of technology suppliers can also be observed in established AM processes, which will lead to various mergers and acquisitions in the years ahead. In stereolithography, laser powder bed fusion, and FDM, companies' strategies are shifting more and more toward profit-oriented structures. Their investments are thus being tied much more closely to specific market and profi-

tability prospects. Some companies that have been active in AM for many years have even been making significant cuts and reorganizing their operations of late to reflect the market corrections that have taken place.

Meanwhile, the situation in new, forward-thinking technologies could hardly be more different: Expansive investments in start-ups like Seurat or Nexa3D have shown that AM is far from reaching its full potential and more major growth can be expected in the coming years.

Der Autor Matthias Schmidt-Lehr ist CEO und Co-Founder von Ampower. Das Unternehmen veröffentlicht im März eines jeden Jahres einen Marktreport, der die globale Entwicklung der additiven Fertigung untersucht.

Ampower at Formnext 2021 Hall 12.0 / Booth E98

AMPOWER GmbH & Co.

2021,

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EXHIBITOR NEWS

FUME FILTRATION FOR LASER AM PROCEDURES

ydac will be using the upcoming Formnext event to unveil its new fume filtration system for additive manufacturing (specifically with SLM technology). The Flush-PACK system removes particles from protective gas by means of a gas filter. A pressure reservoir filled by a compressor ensures back-flushing in the filter and allows the collected grime to fall to the bottom. There, it is bound by

ydac will be using the upcoming Formnext a passivation fluid, which is then extracted into event to unveil its new fume filtration a separate container for storage.

According to Hydac, passivating the grime directly in the filter eliminates the need for personal protective equipment (PPE) when changing the filter. At the same time, the company has made the procedure both safer for operators and more economical due to how long filters can be used. Plus, a replacement system in which

filters can simply be sent back to Hydac means customers don't have to pay for disposal.

Thanks to its use of passivation fluid, FlushPACK is compatible with all types of powder material.

Hydac says that it's even possible to switch materials without changing the filter.

Hydac at Formnext 2021 Hall 12.0 / Booth A01H

FUNCTIONAL MATERIALS AND LARGE SIZES

Ithough Intamsys Technology Co. Ltd of Shanghai has attended Formnext before, the 2021 edition will be the first one it participates in since establishing its EMEA subsidiary in Ostfildern (near Stuttgart, Germany). Intamsys Technology GmbH will showcase the newest Intamsys model to be launched in EMEA: the Funmat Pro 610 HT, which is the company's latest large-scale, industrial-grade FFF 3D printer.

According to Intamsys, the 3D printer's chamber temperature, open-source system, and size (1710 x 1390 x 2080 mm) open up a multitude of possibilities for production in aerospace, automotive, and other high-tech industries. Its build volume facilitates the printing of large-scale parts with materials

like PEEK, PEKK, ULTEM (PEI), PPSU, and other functional materials without warpage.

The company will also release new support materials. SP5040 is an exclusive support material to be combined with ULTEM 9085, while SP5080 is the exclusive support material for ULTEM 1010.

Intamsys provides high-performance 3D

printing materials, direct additive manufacturing solutions, and corresponding software. Co-founded by a team of engineers, the Chinese company has established an international marketing and after-sales service system that includes two marketing and technical service centers located in Germany and the United States, respectively.



Intamsys at Formnext 2021 Hall 12.1 / Booth B61

AUTOMATED QUALITY CONTROL



vatronix SA will present its latest
EviXscan 3D products and solutions at
Formnext 2021, along with 3D scanners
capable of a variety of ranges and levels of
accuracy. The Polish company will also present solutions for automated quality control,
such as automatic scanning systems and 3D
scanners that interface with collaborative
robots.

Evatronix SA offers services in the design of electronic and mechatronic devices with accompanying software. In cooperation with proven subcontractors along the value

chain, the company realizes prototype series and pilot / low-volume production of devices of its own design. In the Polish market, Evatronix also acts as a supplier of printed circuit boards and Pulsonix software for designing PCBs. The company's innovativeness and global reach have even been recognized by the local government: In 2019, Evatronix received the prestigious Company of the Year award of the City of Bielsko-Biała.

Evatronix SA at Formnext 2021 Hall 12.1 / Booth F62

EXHIBITOR NEWS

SMALL-SCALE PRODUCTION OF OXIDE CERAMICS

t Formnext 2021, Lithoz GmbH will be presenting a wide variety of pioneering multi-material parts produced with the Cerafab Multi 2M30, one of the company's 3D printers. The showcased parts will feature combinations of ceramics, ceramic and metal, and ceramic and polymer. Lithoz reports that the Cerafab Multi 2M30, which was launched in late 2020, is able to print using two materials simultaneously, facilitating the production of accurate and detailed parts with combinations of the aforementioned materials. (The picture shows a part made of pure copper and ceramic.)

Alongside these multi-material parts, the second highlight at the Lithoz booth will be the live demonstration of its new entry-level 3D printer – the Cerafab Lab L30. This European premiere will be the first time this compact model can be experienced in full operation.



The Cerafab Lab L30 has been specifically developed for the customization and small-scale production of oxide ceramics and is engineered to be a starting point for ceramic 3D printing. Johannes Benedikt, CTO and co-founder of Lithoz, says the machine is suited to academia, researchers, and material and application developers.

Lithoz at Formnext 2021 Hall 12.1 / Booth C21

FULLY AUTOMATIC BED LEVELING

BigRep is introducing the new BigRep Pro, which includes upgrades that "make printing even easier and ensure your parts are right the first time, every time«. The BigRep Pro now comes standard with fully automatic bed leveling and extrusion. Equipped with the second-generation BigRep Precision Motions Portal, it can handle even higher speeds, faster acceleration, and heavier payloads. The upgraded keep-dry cabinet supports optimal material handling, as well.

BigRep at Formnext 2021 Hall 12.1 / Booth F01

SIZE IS NO ISSUE

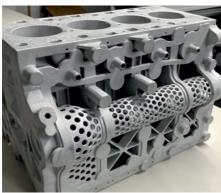
his year, Big Metal Additive (BMA) plans to showcase prototypes made from its unique metal-hybrid additive manufacturing process. The BMA booth will have parts on display that demonstrate the capabilities of the company's hybrid process, where additive and subtractive technologies work together to improve quality, control dimensions, and provide fully machined surfaces. These parts will exhibit BMA's abilities as a casting replacement provider that knows how to use topology optimization to innovate and develop new concepts.

By combining these skills with its expert engineering services, BMA can produce a wide range of products for its customers – from traditional designs that are rapidly reconfigurable to new, fully optimized designs. Meanwhile, size is no issue at Big Metal Additive: Formnext 2021 visitors will have the chance learn about a full-scale eVTOL-optimized airframe component produced at BMA that measures 127 x 162 x 66 cm and includes challenging geometry and overhangs.



Big Metal Additive at Formnext 2021 Hall 12.0 / Booth A125

DIESEL ENGINE CLEANER THANKS TO AM





Research project examining the potential of additive manufacturing for combustion engines

ven though electric and hydrogen drives are on everyone's lips in the mobility world, conventional combustion engines are also being developed further. »For one thing, the diesel engine definitely has its uses, such as in ships or trains, « explains Nils Büchau, research associate at the Chair of Internal Combustion Engines (VKA) at RWTH Aachen University. »You can't just offer everyone a Tesla in developing countries, either.«

With the VKA, Büchau is involved in a research project investigating the use of additive manufacturing for combustion engines. Under the consortium leadership of engineering service provider FEV Europe GmbH, the BMWi-funded LeiMot project is working on a conventional diesel engine from VW (Volkswagen 2.0 TDI, EA 288 evo), mainly with an eye toward exploring the potential of additive lightweight components.

The focus thus far has been on the cylinder head and aluminum crankcase of the four-cylinder engine. Here, the use of AM indicated the highest potential for optimization. »The components have been redesigned to support subsequent additive manufacturing. New features that improve cooling and lubrication have also come into play,« Büchau says.

The LeiMot project has achieved improved cooling performance by reducing the diameters of the cooling lines to as little as three millimeters and positioning them to more efficiently dissipate heat directly at critical points. The resulting higher flow velocities have contributed to the improvements, as well.

In addition, the thinner cooling lines have reduced the volume of coolant in the cylinder head by over 60%, which gives the diesel engine a significant advantage. »Here, emissions occur almost exclusively in the cold-running phase,« Büchau reports. »Thanks to the smaller cooling circuit, the engine reaches its operating temperature more quickly and thus

»NOT ONE-SIZE-FITS-ALL«

Büchau and his research colleagues also gained important insights during the additive manufacturing of the 8.6-kilogram cylinder head, which was 3D-printed from the aluminum alloy AlSi10Mg over about four days using selective laser melting (SLM) on an X Line system from Concept Laser. »When you print faster, it results in rougher surfaces. Printing slower takes longer, but you get a better surface finish, which has a clear impact with thinner cross sections, « says Büchau. »There's no one-size-fits-all approach here; the advantages you gain in one area a have an impact in another.« This has also been demonstrated in the post-processing of 3D-printed components. »The surface finish in the small channels requires electrochemical treatment (Hirtisation).

The 8.6-kilogram cylinder head was 3D-printed from the aluminum alloy AlSi10Mg using selective laser melting (SLM) on an XLine machine from Concept Laser

Mas

However, this process has to take place after heat treatment due to the chemical reactions in the aluminum allov.« Buchau continues. »A different orientation of the components to be printed in the powder bed can also lead to improved surfaces without electrochemical post-treatment.«

LUXURY SEGMENT OR CASTING

Even if the high cost of additive manufacturing still makes the use of the cylinder head or crankcase in automotive series production rather unlikely, Büchau draws a very positive interim conclusion: The concept of 3D-printing these two parts - which are about 22 percent lighter than the reference components – is quite realistic in the near future in small series motor sports, or low volumes in the 10,000-20,000 range. »That's where the patented cooling system and additive manufacturing in particular can help push diesel technology even

further, even with new fuels.« Büchau explains. Meanwhile, he has high hopes for another novel approach: The features developed in the LeiMot project can also be used for cast cylinder heads and crankcases using things like 3D-printed cores.

FURTHER INFORMATION:

- » fev.com
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EXHIBITOR NEWS

FROM MEDICAL IMPLANTS TO BASEBALL BATS

t Formnext 2021, Arburg will be presenting a broad range of high-end machines, innovative applications, and examples of exciting components - some of which involve the production of implants made of medical-grade PEEK. A total of four free-forming units and the portfolio of the company's sister company innovatiQ will be on display. Meanwhile, the components will include highlights such as custom baseball bats from Wilson and Tesa adhesives that see use in additive smartphone manufacturing.

PEEK (polyetheretherketone) is particularly interesting in connection with applications of medical technology. At this year's Formnext, the 300-3X – a free-form 3D printer designed for high-temperature applications - will be processing Vestakeep® i2 G, which is an original plastic granulate produced by Arburg partner Evonik for custom cranial implants. This material is certified for permanent medical implants and thus expands the potential use cases for Arburg's approach to free-forming plastic (AKF).

Another application of medical technology will be demonstrated as part of a composite material project with the University Hospital of Basel, which uses another free-form printer (the Arburg 200-3X). The unit the company is bringing to Frankfurt works with the reabsorbable implant resomer LR 706 - a composite of poly L-lactide-co-D, L-lactide, and ß-TCP (also from Evonik) that contains 30% ceramic additives. This material not only makes implants

more stable, but also releases calcium to promote bone growth.

Arburg will be using numerous examples to show how free-forming customers can generate added value. Another highlight will feature baseball bats from Wilson, a US sporting goods manufacturer that uses the AKF technique to refine mass-produced items (like bat handles) according to customers' individual specifica-

Arburg's products can also be used in the area of automation solutions and operating materials. A 300-3X will be manufacturing a dual-component gripper out of PC/ABS and TPU that is designed to handle a complex removal task in Arburg's production of injection parts. The key lies in a soft TPU membrane that expands in a form-fitting way through the use of pressurized air. Arburg will also be working with another partner, OTEC, to show how AKF components can achieve the same surface quality as injection parts through post-processing.

The claim that the free-forming 300-3X can even process unusual materials is something that Tesa has already proven in practice. Formnext will also feature a smartphone with a glued glass cover that reduces waste by around 90% compared to conventional adhesive methods thanks to AKF.

Along with the company's four free-form display units, Arburg's booth will also be showcasing the portfolio of innovatiQ for the first time, which will include the 3D printing system LiQ 320. Since this company was integrated into the Arburg family in 2020, Arburg has been offering additional AM technology to its customers to enable them to operate more flexibly in their respective markets. The LiQ 320 uses liquid additive manufacturing (LAM) to produce components out of liquid silicon rubber

Arburg at Formnext 2021 Hall 12.1 / Booth D131



SELF-PRIMING AND DRY-RUNNING

■ ith the FP 70, KNF has added another low-pulsation pump to its smooth flow series. The company says its new pump combines the low pulsation from gear and centrifugal pumps with the strengths of diaphragm pumps.

The KNF FP 70 is a self-priming, chemically resistant pump that can run dry and handle liquid transfers both cleanly and gently. Thanks to the integration of corresponding technology, there is no need for additional pulsation dampening elements and tubing. This means the pump can operate with particularly low pulsation even where space is

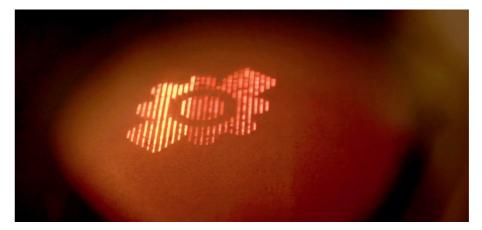
The system's requirements also come first when selecting the motor: The smooth flow pump can be equipped with motors of different performance classes, and their parameters can be precisely customized

The KNF FP 70 is capable of flows of up to 850 ml per minute and is designed to operate at up to 2 bar (29.4 PSIG). Furthermore, its patented four-point valves ensure the reliable self-priming of the pump. No additional priming pump is required to fill and drain the system.

KNF at Formnext 2021 Hall 12.0 / Booth E110

EXHIBITOR NEWS

FREE OF RESIDUAL STRESSES



ayland Additive will be exhibiting its metal additive manufacturing system, Calibur3, at this year's Formnext. The Neubeam process it features provides manufacturers with access to a genuine metal AM production alternative. According to Wayland Additive, this is because Neubeam delivers on all the advantages of metal eBeam powder bed fusion (PBF) technology while overcoming the troublesome issues that have traditionally limited wider adoption.

The company reports that Calibur3 can produce parts that are free of residual stresses because high temperatures are only applied to the part and not the whole powder bed, which ensures free-flowing powder post-build (no sinter cake) and stress-free parts with reduced energy consumption. This makes the process considerably more cost-efficient and flexible in terms of part geometries because, as Wayland Additive states, heat treatments and other post-processing steps are dramatically reduced.

Wayland Additive at Formnext 2021 Hall 12.0 / Booth B139

MORE THAN AIR FILTRATION FOR POST-PROCESSING

t Formnext, ULT AG will demonstrate how extraction and filtration systems support both additive manufacturing processes (in metallic powder-bed fusion) and post-processing. The company's trade show presence will center on Ultim3D, a new modular concept with proven standard components that can be customized to individual new applications.

»Based on our 20 years of experience in the additive manufacturing market, we're able to quickly and easily offer solutions that go far beyond standard systems for intergas cleaning or air filtration during post-processing,« explains Boris Frühauf, ULT AG's key account manager for additive manufacturing/laser technologies.

By its own account, ULT AG was one of the pioneers in the field of extraction and filter technology and gas cleaning systems for additive manufacturing. In addition, the company offers solutions for process air drying. The modular systems in the ULT Dry-Tec series control air humidity for powder handling, powder storage, and the overall process, among other uses.

ULT at Formnext 2021 Hall 11.0 / Booth D42

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EXHIBITOR NEWS

RICH SOUNDS FROM NATURAL FORMS





t started, as many creative revolutions do, with a problem. »I'm a designer, a creative, « says Ondrej Chotovinsky, Founder of Deeptime Audio, »so I spend a lot of time working at my desk listening to music. « There are a few items you will find on every creative's desk: a computer, a large monitor, and speakers. The problem, however, was that music fans faced a choice. Standard PC speakers are compact but generally have poor sound performance. On the other hand, professional sound equipment like studio sound monitors are large and expensive. And neither of these options offer the visual appeal of something designers want to have on their desk.

The quality of a speaker's sound is not just determined by the electronics built into it, but by the acoustic properties of the casing the electronics are housed in. Traditional speakers are made of sheets of MDF or plywood. With

the added strength of a box-shaped construction, the finished case is stiff and airtight to reduce vibration and create a resonant chamber behind the speaker membrane.

But what if you don't want your speakers to be box-shaped? This was the start of an eight-year quest for the perfect speakers, made possible by an innovation that is revolutionizing the creative industry: 3D printing. "We started with 3D printing in plastics," says Chotovinsky. "They looked fantastic, but the sound wasn't that great." It's a logical place to start — 3D printed plastic can be used to build more interesting shapes, but the material is light and not particularly rigid. This is a problem for sound quality since an unstable speaker cabinet will cause adverse resonances.

The breakthrough came when Chotovinsky discovered 3D sand printing at ExOne. By using their binder jetting process, the first printed objects were made from a combination of sand and adhesive.

The prints this method produces are heavy and stiff, but porous, which is not ideal for acoustic applications. Speaker cases need to be airtight, to produce a clean sound free from distortion, so further processing would be necessary to the sand forms.

After years of experimentation Deeptime had found the perfect solution. Now, the raw housing is printed at the ExOne Adoption Center in Germany and shipped to the Deeptime facility just outside Prague, arriving seven days later. In the course of the manufacturing process the prints are cleaned and repeatedly dipped in a proprietary solution that impregnates the porous sand structure. A slow curing process over two months ensures that the material hardens and the housing is airtight and dense.

The spiral design of the finished Deeptime Spirula satellite speaker mirrors the organic shapes found in nature – the curve of a seashell or the proportions of an uncurling fern leaf.

ExOne at Formnext 2021 Hall 12.0 / Booth D69

NEW EXTRUDER SUPPORTS VARIOUS MATERIALS

IM3D, a leading manufacturer of multimaterial 3D printers, spent the first half of 2021 developing a new generation of extruders for composite extrusion modeling that it now plans to unveil for the first time at Formnext. The CEM-E2 is a multimaterial AM extruder that is capable of printing with metal, plastic, and ceramic. Meanwhile, AIM3D is now working on several larger 3D printers that work with granulate and promise to offer both more construction space and higher build speeds.

The heads of the CEM-E2 extruder are designed for specific groups of materials. Version »M« handles metal injection molding (MIM) granulate, while »P« is to be used with filled and unfilled types of plastic. Finally, the »C« head was developed for ceramic injection molding (CIM) granulate and applications that require higher abrasion resistance. Among other features, this new extruder delivers material with much greater accuracy, which AIM3D says results in components with improved surface quality and better mechanical characteristics. Its extrusion speed has also been boosted by more than 200%, with build rates of up to 220 cm³ per hour now possible with a 0.4 mm nozzle.

According to AIM3D, the key advantage of CEM technology lies in how it facilitates the use of several materials. In addition, it's often possible to eschew filament in favor of conventional granulate, which is considerably more cost-efficient.

AIM3D at Formnext 2021 Hall 12.1 / Booth A66



Photos: Deeptime, AIM3D, Ponticon

EXHIBITOR NEWS

SCREENING HUNDREDS OF NEW ALLOY VARIANTS IN ONE DAY

t Formnext, Ponticon GmbH will present the Pontimat process for developing new metallic materials for additive manufacturing. As the company points out, this will make it possible to produce and test a wide range of alloy variants very quickly for the first time.

With the Pontimat process, application-specific materials can be produced and tested in short order with minimal use of resources. Thanks to its flexibility in the selec-



tion of metallic alloying elements and selectively adjustable cooling rates, it is particularly suitable for the development of novel materials for additive manufacturing, Ponticon says.

The new process is based on the Extreme High Speed Laser Cladding (EHLA) 3D process. Having developed this method in collaboration with the Aachen-based Fraunhofer Institute for Laser Technology ILT and the Digital Additive Production (DAP) chair at RWTH Aachen University, Ponticon has now brought EHLA to market.

The pE3D system used for the process can achieve cooling rates between 100 K/s and 10 million K/s in the solidification process. This makes it possible to influence microstructures within an unprecedented range of limits.

For the development of application-specific alloys, the system produces several test specimens 1 cm³ in volume (for example) on a substrate within a very short time, which can be analyzed metallurgically. In this way, it is possible to process hundreds of alloy variants per day in an agile approach and then test their properties.

Tobias Stittgen, managing director of Ponticon GmbH, sees significant benefits for his customers. »In terms of design, many com-



ponents are already optimized for additive manufacturing. However, significantly greater potential for improving functionality lies in the material.«

Ponticon at Formnext 2021 Hall 12.0 / Booth A01C



EXHIBITOR NEWS

BATCH PROCESSES WITH STANDARD WAFERS

anoscribe plans to attend Formnext with the new Quantum X shape — an ultra-precise 3D printer for rapid prototyping and wafer-scale batch processing in research and industry. Based on two-photon polymerization (2PP), this laser lithography system combines proprietary printing technologies that make it the optimal tool for the microfabrication of virtually any 2.5D or 3D shape with submicron precision on areas up to 25 cm².

An upright system with an automatic photoresin-dispensing function, the Quantum X shape is suitable for industrial batch processes with standard wafers up to six inches in size. According to Nanoscribe, this expands the 3D microfabrication opportunities in multiple rese-

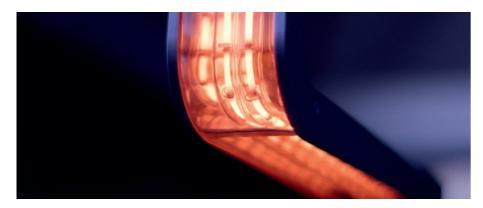
arch fields and industries, such as life sciences, material engineering, microfluidics, micro-optics, micromechanics, and microelectromechanical systems (MEMS).

The Quantum X shape's output is the result of a galvo system and electronics system control units on a granite-based platform, which is combined with an industrial-grade femtosecond pulsed laser. The system features laser focus trajectory control that accelerates and decelerates the galvo mirror units to the optimum scanning speed and dynamically adjusts the laser power at 1 MHz modulation rates.

Nanoscribe at Formnext 2021 Hall 12.1 / Booth G61



FROM UV TO IR



shio Europe, a manufacturer of industrial light sources that range from ultraviolet (UV) to infrared (IR), has developed the IRtenser series of infrared heating modules and auxiliary components. Designed for both experimental processes and standard heating applications, IRtenser covers the basic building blocks required in many heating processes. The standard portfolio consists of IR modules that produce wavelengths ranging from 0.8–1.5 µm, and power densities from 150–300 kW/m². All the IRtenser modules feature integrated cooling and a quick exchange mechanism for IR lamps, and they are ready for immediate use. Ushio says it is able to customize its pro-

ducts to very specific requirements and can even replicate individual in-line processes at its Infrared Application Laboratory in Steinhöring, Bavaria. The IRtenser LC220 Demonstrator, which will be on display at Formnext, is meant to show potential partners how cooperating with Ushio facilitates joint research, development, and implementation. The L-shaped module is hooked up to a display that monitors the heating effect of IR irradiation that is achieved throughout the treatment of various common substrates.

Ushio at Formnext 2021 Hall 12.1 / Booth A81

COMPACT LPBF 3D PRINTERS

It, a Ukrainian producer of compact LPBF 3D printers, will showcase new machines that it describes as ideal combinations of size, performance, and price. The Alfa-150D is a compact machine for metal 3D printing with a build volume of 150 x 150 x 180 mm, which makes it suitable for R&D and small high-precision batches. Its bigger brother, the Alfa-280, is an industrial 3D printer for prototyping and medium-batch production. It offers a build volume of 280 x 280 x 300 mm, with either single or double 500-W water-cooled ytterbium fiber lasers and build rates of up to 50 cm3/hour.

ALT at Formnext 2021 Hall 12.0 / Booth E102

EXHIBITOR NEWS

PARTS UP TO ONE CUBIC METER IN SIZE

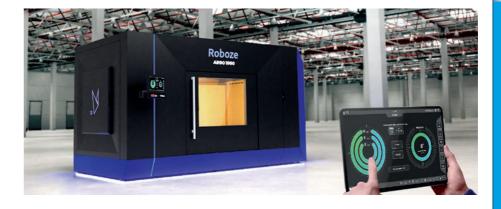
oboze is set to present the Argo 1000, which the company says is the world's first 3D printer with a heated chamber designed to produce large-scale parts with super polymers and composites for industrial applications.

The Argo 1000 can produce parts up to one cubic meter in size, or nearly 40 inches by 40 inches by 40 inches by 40 inches. Using more sustainable and high-performance super polymers and composites such as PEEK, Carbon PEEK, and Ultem AM9085F, Roboze is reducing the current strain on global supply chains and rapidly

replacing metal parts and mission-critical components for extreme applications.

»We've gone far beyond prototypes and are now building custom components for miniature satellites, gears for military-grade vessels, and parts for companies that are developing Italy's sustainable infrastructure, « adds Alessio Lorusso, founder and CEO of Roboze. The Argo 1000 will be available for commercial distribution in 2022.

Roboze at Formnext 2021 Hall 12.1 / Booth C101



BIO-BASED VAPOR SMOOTHING OF PP PARTS

yemansion, a provider of post-processing solutions for industrial-polymer 3D printing, will showcase several realworld applications and demo parts created with its new Vaporfuse Surfacing solution.

According to EU specifications, Dyemansion's Vaporfuse Surfacing process for sealed surfaces is also compliant with US Food and Drug Administration (FDA) regulations on food contact. Meanwhile, the company says that Vaporfuse VF47 Eco Fluid solvent can be used for contact with all types of food for which the base polymer is both technically suitable and approved.

In addition, Dyemansion is opening up another avenue for steam-cleaning polypropylene (PP) parts with the development of an environmentally friendly solvent that is bio-based and biodegradable. This solution is currently being validated with various polypropylene materials and has already been successfully tested with Ricoh PP, HP Ultrasint PP, ALM PP400, VoxeljetPP, AM Polymers PP03, Ultimaker PP (FDM printed), EOS PP1101, and DSM Arnilene AM6002. Results obtained with a beta version of Powerfuse S for polypropylene smoothing will also be on display at Formnext.

Dyemansion at Formnext 2021 Hall 12.1 / Booth D21





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INSPIRED BY THE POTTER WASP

[24]

Massimo Moretti founded WASP in 2012



hen you step through the door of the World's Advanced Saving Project (WASP) in Italy, the contrast to the outside world could hardly be greater. Framed by what appears to be a collection of 3D-printed chairs, busts, house parts, human figures, and colorful, flashing 3D printers, there are around two dozen workstations lined up in rows. The people seated at these desks are mostly young, and new designs or evaluations of development projects flicker on their laptop screens. The whole thing is reminiscent of the open offices of American start-ups, but it's somehow more colorful and uncluttered here. This also corresponds to the company's quiding principle: being as creative as possible with a constant urge to develop new things quickly.

Inspired by the potter wasp, Massimo Moretti founded the company in 2012 to produce sustainable houses using 3D printing and develop viable construction processes based on the principles of circular economy and digital fabrication. He still leads the company today with a group of young co-founders that includes his daughter, Francesca, who also happens to be WASP's CEO. Sustainable materials are a key priority here — not only in 3D-printing houses, but also in using bio- and recycled

plastics. WASP also utilizes natural materials such as clay, sand, lime, straw and, in some cases, rice husks – all of which are sourced as directly as possible from building sites or the surrounding area.

3D-PRINTED CONSTRUCTIONS BASED ON NATURAL MATERIALS

In October 2018, WASP built Gaia – the first house to be 3D-printed from raw earth materials. The world's first 3D-printed eco-habitat, Tecla, then followed in 2020. The only fully 3D-printed construction based on natural materials, Tecla was made with multiple Crane-3D printers working at the same time. Both of these extraordinary prototypes are located at Shamballa Park, which is part of WASP's headquarters in Ravenna.

Meanwhile, another WASP development project in Dubai shows how much steam the business of sustainable 3D-printed houses has picked up. This past summer, the company was also able to exhibit a 3D-printed house in a pedestrian area of Wiesbaden, Germany.

PROFITING FROM OTHER BUSINESS AREAS

WASP invests the revenue it generates from its 3D printers in research and develop-

ment on integrated projects. With its four printer families (Pro, Clay, Industrial X, and Crane Architecture), the company enables a wide range of applications, from prototypes and furniture to clay and ceramic components that can be used industrially. At Formnext 2021, WASP will be launching seven innovative machines — each dedicated to a different industrial sector — at two booths. PEEK, clay, industrial clay, and concrete are just a few of the materials that can be used with its technology.

WASP's proximity to the art scene is likely due to its own high level of creativity. »What we do best is develop quickly, « Massimo Moretti says. Having grown for years, the company now collaborates with universities, research centers, and academies located in various parts of the world. It has also created an international network for 3D printing services.

WASP at Formnext 2021 Hall 12.0 / Booth B59 and Hall 12.1 / Booth G102

BERLIN

WHERE AM TAKES OFF!

Berlin is one of the most attractive locations in Europe for additive manufacturing and 3D printing technologies. Along-side renowned machine manufacturers, software companies, international networks and hubs, Berlin also boasts new university faculties and professorships and relevant research projects to cover the complete additive manufacturing value chain.

Berlin's dynamic startup scene is an important factor in the rapid development of additive manufacturing processes, and instances of technology transfer from the universities in the form of spin-outs are numerous. Berlin's outstanding scientific landscape regularly makes important contributions to technological developments. Key areas include digital 3D modeling at the Technische Universität Berlin, printable ceramics, biomaterials, and also quality control processes at the Federal Institute for Materials Research and Testing (BAM), and printed electronics at Fraunhofer IPK and the Berliner Hochschule für Technik (BHT).

With its fully equipped facilities in Marienpark, the Industrial Additive Manufacturing Hub Berlin (IAM Hub) offers interested industrial companies, startups and research institutions a place to initiate joint projects and network in a highly targeted environment.

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EXHIBITOR NEWS

MAINTENANCE-FREE IN XXL



gus, a plastic specialist based in Cologne, Germany, is promising to 3D-print lubricationand maintenance-free components up to three meters in size. According to the company, its lightweight Tribo components are manufactured in a single printing process and are up to 50 times more abrasion-resistant than standard plastics. This would make them suitable for reducing costs in large-scale machine construction. These XXL components are designed for use in fixture construction, special machine construction, and packaging technology. In comparison to machining, they are impressive thanks to their lightweight design, greatly reduced material requirements, and cost efficiency in production. For production in a largeformat 3D printer, Igus relies primarily on the

tribofilament Iglidur I150 and the optically detectable blue variant Iglidur I151. According to the company, these plastics are certified according to EU Regulation 10/2011 for the food industry, and Iglidur I151 is also FDA-compliant. Both filaments can be used with any 3D printer in which the nozzle temperature can be set to 250 degrees Celsius. Since these high-performance plastics have very low shrinkage, they can also be processed by 3D printers that do not have a heatable printing plate, Igus says. At the same time, they have very high wear resistance at sliding speeds of up to 0.2 m/s.

Igus at Formnext 2021 Hall 12.1 / Booth E61

NEW DIVISION FOR METAL POWDERS

ometon S.p.A. is a traditional Italian manufacturer of metal powders for the automotive, chemical, aerospace, and electronics industries. Thanks to its research and development department, Pometon can develop powders tailored to the needs of its customers. These result from new trends and appear on the market every day. Among them, additive manufacturing has also emerged as a promising sector.

Therefore, Pometon decided to invest in the production of metal powders for the 3D printing industry. This resulted in the business unit Pometonplus.

From its headquarters in Maerne, Venice, Pometonplus will benefit from Pometon's almost century-long experience and its effective distribution network, which includes subsidiaries in the UK, Spain, Germany, India, Turkey, and Korea (as well as a second pro-

duction site in Serbia). Pometonplus is expected to start production in the second half of October 2021. Its initial products will represent five major product families: copper-based steel and stainless steel, cobalt-chrome, nickel-chrome, titanium, and titanium alloys.

Pometon at Formnext 2021 Hall 12.0 / Booth E48

SINTERED PBT CREATING NEW POSSIBILITIES IN PRODUCT DEVELOPMENT

ollowing the series-production-ready materials polypropylene (PP) and thermoplastic polyurethane (TPU), Creabis GmbH - a 3D printing service provider based in Kirchheim (near Munich), Germany – says it has now also succeeded in processing polybutylene terephthalate (better known as PBT or PTMT) for use in serial additive laser sintering.

This material, which is widely used in injection molding, is well known to engineers and designers. It is always preferred when the focus is on electrical insulation properties (which are not significantly affected by water absorption, temperature, or frequency), or on a high resistance to abrasion or chemicals.

According to Creabis, the fact that PBT can now be sintered opens up completely new possibilities in product development, as it is possible to work with samples, parts, or assemblies under series production conditions

right from the start. In addition, due to the good surface resolution and dimensional accuracy provided by the material, the finest details (such as miniscule holes and slots) are possible. Components with dimensions of around 240 ×190 ×300 mm³ are currently feasible.

Creabis GmbH at Formnext 2021 Hall 12.1 / Booth D28

EXHIBITOR NEWS

BLUE PA11 MAKES SPORES AND MOLD MORE VISIBLE

n the food industry, the color blue plays an important role. Blue plastics with molded-in color are clearly visible and can be identified in real time on production lines. In this way, they provide predictive support for process safety in a sector where this aspect is particularly critical. For example, blue-colored material makes it possible to identify plastic particles or other debris in food through visual inspection or automatic detection.

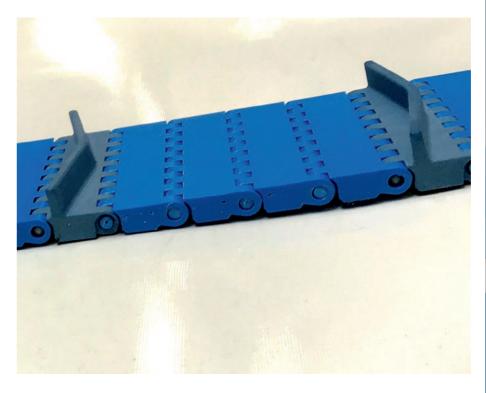
That's why the French company Fabulous has developed a molded-in blue polyamide for industrial laser sintering that will be unveiled for the first time at Formnext. This bio-based plastic. Bluecare, also makes it easier to determine the cleanliness of components. As Fabulous explains, spores, mold, and food or cleaning residue are more visible than with other dyed materials. Bluecare is also certified according to the requirements of international regulations on food contact materials, including in line with EU Regulation No. 10/2011.

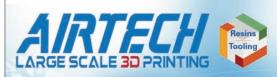
Unlike other polymers, the PA11 polyamide comes from a renewable raw material source.

According to the company, 50 percent of the powder can also be reused, giving it one of the lowest refresh rates in 3D powder printing.

Partner companies have already begun manufacturing components from this material One of Fabulous's partners in the Bluecare project was the French print service bureau ID Print 3D, which used the powder to design 30-centimeter-wide modular elements for food conveyor belts. »This allows us to avoid the costly production of a casting mold for a small number of pieces,« says Patrice Panchot, mana ging director of ID Print 3D. Fabulous now has around 10 customers using the material in Europe, and FDA approval is pending for the US and Canadian markets.

Fabulous at Formnext 2021 Hall 12.1 / Booth F38





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EXHIBITOR NEWS

90% BASED ON RECYCLED PET

he need for sustainable materials is growing in the field of 3D printing, and the Lehvoss Group has responded by launching LUVOCOM 3F eco PET. This material is 90% based on recycled PET, which the group says currently has the highest recycling rate on the market for a PET 3D printing material. LUVOCOM 3F eco PET is designed for the fused filament fabrication (FFF) and fused granulate fabrication (FGF) processes. The possible areas of application include functional prototypes and series parts in numerous industries, such as mechanical engineering, automotive, and medical technology.

The first available product is LUVOCOM 3F eco PET 50291 BK, an unreinforced black type that combines low water absorption with a temperature resistance of up to 125 °C. Lehvoss says that these properties give the material clear advantages over PETG, another variant of PET used in 3D printing.

The Lehvoss Group is also presenting a whole package of LUVOSINT materials that are designed for automotive use based on PP, PA12, and PA6. According to the group, these materials are fully reusable and require no used powder disposal. »Given the current debate on microplastics and sustainability, a non-reusable SLS powder is a no-go for industrial use,« says Marcus Rechberger, product manager for LUVOSINT. The materials in Lehvoss' automotive portfolio are also already true black, so no additional dye process is needed.

In addition, Lehvoss will present a showcase for hybrid technology based on an effective combination of SLS powder printing and traditional casting. The product in question, Blobber, was invented and engineered by Nemeton, an Austrian engineering and 3D printing company. Blobber offers a new concept for customizing bike saddles for each rider. At the core of the invention is an inflatable and removable saddle upper that consists of a shell made by PU casting, but built around an inner SLS-printed lattice structure in which LUVOSINT TPU X92A is used.

Lehvoss Group at Formnext 2021 Hall 12.1 / Booth G109



EXPANDABLE TPU FOAM STRUCTURE

ubrizol's latest development, Varioshore TPU, has resulted from a collaboration with colorFabb. This new 3D printing filament is available with an expandable TPU foam structure, which makes it possible to vary the density of the material by adjusting temperature and material throughput. The hardness of Varioshore TPU thus ranges from 62 to 92 Shore A, and it is compatible with FFF Bowden and direct-drive printers.

Lubrizol 3D Printing Solutions combines material expertise with additive manufacturing capabilities. Its in-depth knowledge of polymer material development dovetails with its various services, which include design for additive manufacturing (DfAM), prototyping, on-demand production, and post-processing.

Lubrizol at Formnext 2021 Hall 12.1 / Booth G84

EXHIBITOR NEWS

SPHERICAL POWDERS WITHOUT »SATELLITES«

t Formnext 2021, southwest Germany's Blue Power Casting Systems will be presenting its expanded portfolio of systems for the production of high-quality metal powders, as well as some innovative solutions for manufacturing semi-finished products.

The focus will be on the new compact ultrasonic atomization system AUS 500, which is specially designed to produce high-quality metal powders in smaller batches. In addition to manufacturing spherical powder that includes no troublesome »satellite« particles, the system features simple and flexible process management.

Blue Power's AUG series of large gas atomizers will also be shown at Formnext. With the option of direct or indirect inductive heating, melting temperatures of up to 2,100° C, and vacuum pressure greater than 5 * 10-2 mbar (HTC versions), AUG atomizers support an extremely wide range of applications, including the atomization of high-melting and highly reactive metals and alloys. The capacities range from 1.5 to 25 liters. In addition, Blue Power is bringing an air classifier to Formnext that can be used to classify metal powder by defined particle sizes.





Blue Power Casting Systems at Formnext 2021 Hall 12.0 / Booth C62

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EXHIBITOR NEWS

OPTIMIZING THE DENTAL WORKFLOW

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aterialise has introduced its new Dental Module for Magics. This addition to the Magics software is desi-

gned to enable dental labs to fully optimize and automate their 3D printing preparation workflow for dental applications.

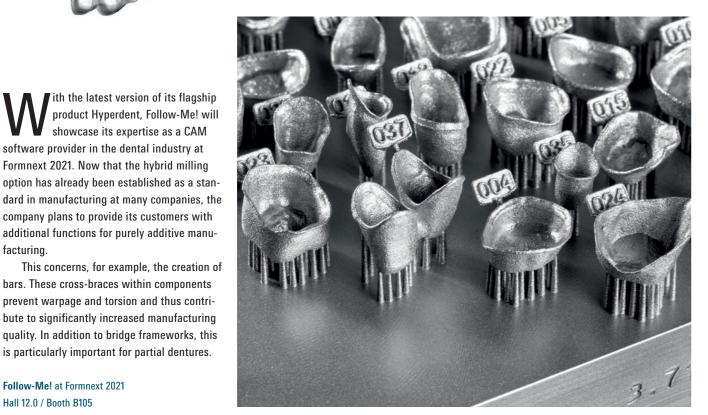
With dentistry becoming more digitalized, Dental Module provides dental labs with the tools required to ensure a scalable 3D printing process. »3D printing has become well established within dentistry, « says Volker Schillen, Market Innovation Manager at Materialise. »Today, many dental labs have their own printers and create custom parts for dental restoration daily. Their next goal is optimizing the workflow so dental specialists can reduce the amount of time spent manually preparing designs to be printed. With automated tools, specialists can instead use this time on other valuable responsibilities, such as meeting with patients.«

The new Dental Module is an add-on to the well-known Magics software platform. Magics offers a range of industry-leading features that allow users to easily and flexibly fix, repair, and edit their 3D files before printing. This versatile software tool

is now enhanced for dental users with the Dental Module, which offers automatic printing preparation for common 3D-printed dental applications such as crowns, bridges, and

After uploading dental CAD designs to the platform, the user simply clicks a button, and the software automates all the required printing preparation steps, such as labeling, nesting, and generating support structures. Tasks that could take hours to complete manually are finalized within a couple of minutes. The module also provides advanced control over processing steps through customizable processing profiles.

Materialise at Formnext 2021 Hall 12.1 / Booth E139



EXHIBITOR NEWS

THIRTEEN TECHNOLOGIES AND OVER 100 MATERIALS

ollowing a major update scheduled for early November, the 3D printing platform Jellypipe will have a number of new functions to show off at Formnext 2021. A new component assistant, for example, makes it possible to select suitable materials and technologies for any 3D-printed product based on its characteristics. Jellypipe is also expanding its functions for ordering parts for complex projects and simplifying its electronic communication. In addition, the appearance and usability of the platform have been completely overhauled. To make Jellypipe easier to integrate into ERP systems and other software solutions, a new public API is now available, as well.

Jellypipe brings midsize companies, customers, and printing partners together on an e-commerce platform of its own design. Users can choose from 13 technologies and more than 100 materials when ordering their 3D-printed components. Midmarket companies involved in areas like contract manufacturing can open an online store on Jellypipe and begin offering AM parts to their customers.

Since its foundation in Switzerland in 2017, Jellypipe has made its platform and services available in all the German-speaking nations, as well as in France, the Benelux countries, and England. A total of 93 solution partners are currently using it to provide their 3D printing services. Jellypipe

selects these partners with care and audits them on a regular basis. Meanwhile, the partners can reach out to the mechanical engineering specialists on Jellypipe's support team for guidance regarding 3D-printing procurement and design. Jellypipe also handles processes in areas such as logistics and invoicing and simplifies collaboration for all those involved.

Jellypipe at Formnext 2021 Hall 12.0 / Booth B810





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Hall 12.0 / Booth B105

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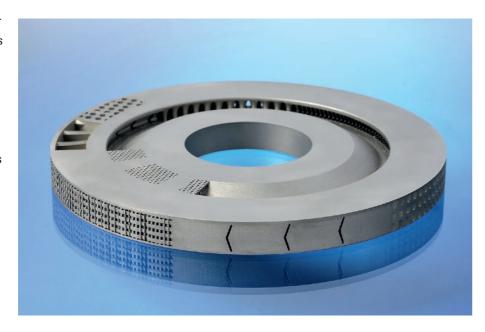
EXHIBITOR NEWS

3D-PRINTED GRINDING WHEEL IMPROVES COOLING, PREVENTS GRINDING BURN

n a design study, a team from Fraunhofer IPT recently developed and implemented concepts for 3D-printed grinding wheels that make it possible to incorporate channels that supply cooling lubricant directly to the contact zone between the tool and workpiece. An effective supply of coolant prevents thermal damage known as "grinding burn" to the material. Particularly in the case of wide grinding wheels or the production of grooves, sufficient cooling of the contact zone is not always ensured by a conventional (lateral) coolant supply.

As a demonstration, a grinding wheel consisting of seven segments was manufactured to test how efficiently cooling lubricant can be delivered to the contact zone. Each segment had a completely different internal structure in terms of not the form of the channel, but the stable columns and grid structures, as well. Furthermore, the internal structures were printed without support structures.

Additive manufacturing processes open up numerous possibilities that are not limited to grinding wheels for tool engineering applications. Therefore, Fraunhofer IPT plans to develop the use of additive manufacturing



further to redesign and improve tools for conventional (e.g. grinding and milling) and non-conventional manufacturing processes (such as electrochemical machining, or ECM) to increase their performance and improve their application behavior. Fraunhofer IPT at Formnext 2021 Hall 12.0 / Booth D41

TRAINING PARTNER FROM THE FIELD



t Formnext, Toolcraft subsidiary AMbitious will present its expertise in AM consulting, training, and software for the first time. AMbitious is also a partner and reseller of Siemens' NX AM Smart Expert.

As a new division of Toolcraft AG, AMbitious is benefiting from its parent company's 30 years of experience in the production of high-end precision components. It thus describes itself as a partner that uses practical methods for practical scenarios.

The training AMbitious offers ranges from interactive basic seminars with an overview of the most important technologies in the field of AM to expert training that deals with crucial AM technologies and pinpoints individual process steps. »In addition, we offer companies

individual training courses and provide support for questions on a wide variety of topics along the entire AM process chain,« says Uwe Schulmeister, AMbitious division manager.

AMbitious at Formnext 2021 Hall 12.0 / Booth A01B

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EXHIBITOR NEWS

FOUR NEW FFF PRODUCTS





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portfolio. At Formnext, they will have several new products to demonstrate.

For example, Xioneer is launching its VXL-Go bundle, a bare-bones support removal set that uses an agitated heated bath to quickly dissolve VXL soluble support filaments (which it started selling two years ago). For those who dissolve supports regularly and need more space for their parts, the company is rolling out its Vortex EZ support removal station. This

product has a large double-walled stainlesssteel tank, a powerful heater, agitation, and a number of features to boost and simplify the dissolution of FFF support materials. The part basket makes it possible to dissolve parts up to 465 x 275 x 210 mm in size.

Meanwhile, Vortex PRO is a brand-new support removal station that dissolves supports at the press of a button. The fully computerized device pumps solution fluids in and out of the tank, runs a multi-step washing program, and rinses parts in a single fully automated cycle.

To handle massive throughput in 3D printing, Xioneer is also to launch the MB140, an industrial-grade support-removal work center for FFF parts. The device is fully automated and opens up virtually endless possibilities in removing supports in the world of industrial FFF 3D printing.

Xioneer at Formnext 2021 Hall 12.1 / Booth B129

POST-PROCESSING SEALED OFF FROM BREATHABLE AIR

n the ENESKApostprocess system, the surface specialists at joke Technology have launched a fully enclosed workstation for the post-processing of 3D-printed components. According to the company, all the steps involved can be completed in a closed workspace regardless of the material in use. This means the user has no contact with any fumes or residual material produced. Manual handling is also possible with special sealed gloves that can reach into the enclosure.

Meanwhile, the working area can be equipped with a variety of electrical and pneumatic tools to facilitate a wide range of post-processing tasks in the same device — detaching printed parts from the substrate, removing support structures and residual powder, deburring components, and carrying out rough or fine surface treatments (including finishing), for example.

The powder and dust produced throughout these various operations are reliably extracted and collected. This prevents explosions and low-speed detonations that could otherwise occur depending on the material to be processed, which could potentially put the user's life at risk. The ENESKApostprocess workstation is already in use (among other places) at the Fraunhofer Institute for Laser Technology ILT in Aachen, Germany.

At Formnext 2021, joke Technology will also be showcasing grinding, milling, and polishing systems from its ENESKA series. ENESKAmicro and ENESKAsonic, for instance, include control units and drive systems with corresponding handpieces and tools. The latest development in the series, ENESKAmobile, also offers a battery-powered grinding and polishing system for industrial requirements.



Joke Technology at Formnext 2021 Hall 12.0 / Booth B119

EXHIBITOR NEWS

SURFACE FINISHING FOR AM NEOPHYTES

t Formnext 2021, Walther Trowal will be on hand to present the Trogvibrator TRT 83/87, which is designed for use in post-processing the surfaces of 3D-printed components. It is capable of producing smooth, polished surfaces by means of vibratory finishing, especially when small batch sizes are involved.

Walther Trowal has developed its vibratory finishing machines specifically for AM workpieces. They are fine-tuned to handle the coarse surfaces often seen in additive manufacturing – the »staircasing« effect, marks left behind by support structures, and baked-on powder residue, for example.

In the Trogvibrator TRT 83/87, the workpiece at hand is inserted into the rotary vibra-



tor bed. The vibration of the trough produces relative motion between the workpiece and the rotary vibrators, which in turn results in a smooth, consistent surface. Christoph Cruse, director of sales at Walther Trowal, describes the TRT 83/87 as a machine suitable for those just getting started in AM.



Walther Trowal at Formnext 2021 Hall 12.0 / Booth E12



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