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fon

formnext magazine

But just recently, the time of a single generation's radical change from technology has become faster than the way society can think about it.

[Astro Teller, Google X]

Cover: Autodesk

EDITORIAL

While most of us are enjoying the summer, it probably seems a bit dull to some of the soccer fans out there. This year's national champions have already been crowned across Europe, and there's no upcoming continental tournament or World Cup to spread the usual euphoria in the months ahead. Instead, teams will have time to adjust their systems, improve their creativity on the field, or, as coaches like to preach, »practice routines until they come naturally«.

Soccer is tremendously popular right here in Frankfurt, as well. Sometimes our teams put on refined, strategic performances, but more often than not – and I hope the die-hard Eintracht fans reading this will forgive me – they rely on their grit and determination.

Sporting that same kind of creativity and passion, we're ready to kick off the third season of the formnext conference and exhibition. Our own strategy is based on a rock-solid back line of service-oriented veterans and some neat tiki-taka among various industries, which will be bouncing ideas off each other at midfield. Up front, we'll be spread out wide with a deep squad of exhibitors that will be going for goal in a number of innovative ways.

In just our first two seasons, we managed to excite fans around the world and add a lot more exhibitors to our team. Part of this success has definitely been due to the two years we've spent drilling our formnext tactics, which are coming more and more naturally to our event personnel. And while you can count on the formnext team to have its service game running like clockwork, the fresh, compelling ideas we keep coming up with make us as unpredictable as any great soccer club.

This edition of fon mag brings you all the latest on our activities and those of our partners throughout the industry. The magazine was also recently made available online, by the way (fon-mag.com), where you can also find more interactive information, images, and videos.

I'm glad to have you on board as an exhibitor, visitor, partner, or fan as the formnext fan bus rolls on to join the champions league of exhibitions.

Sincerely,
Sascha F. Wenzler

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Photos: Klerx (above), Urbanmaker

INDUSTRY NEWS

FORMNEXT CONTINUES TO FLOURISH, HAVING ALREADY ACQUIRED 100 NEW EXHIBITORS FROM 22 COUNTRIES

A full six months before it opens its doors, formnext 2017 has already surpassed the amount of exhibition space it occupied last year. More than 19,000 square meters had already been spoken for as of the middle of May 2017.

»In its third year, formnext continues to grow at a rapid pace, further affirming our innovative exhibition concept,« reports Sascha F. Wenzler, Head of Division for formnext at event organizer Mesago Messe Frankfurt GmbH. »Our numbers were already solid last year, but we'll have outperformed them by a considerable margin by the time this year's event starts. It's clear that formnext is the leading exhibition for the next generation of intelligent industrial production.«

For the first time, formnext 2017 will occupy two levels of Hall 3 at Frankfurt am Main's exhibition grounds. Forming part of the basis for the event's strong growth is the large number of new exhibitors it is attracting. 100 companies from 22 countries have signed up for formnext for the first time, including renowned names like BASF, Desktop Metal, Protiq, Sodick, and Wacker. As of the middle of May 2017, this has already put the number of registered exhibitors (288) close to last year's final tally (307).

+ FURTHER INFORMATION:
» formnext.com/exhibitor

HANNI LAMP TAKES ONE NIGHT TO MAKE

A sleek orange object shaped something like a beehive illuminates the cover of the March edition of formnext magazine. Beneath the surface of its elegant facets lies »Hanni«, a 3D-printed lamp from Urbanmaker. The same creation adorned the company's exhibition booth at formnext 2016; it can also be seen in Urbanmaker's own display window in Münster, Germany.

In Hanni, Urbanmaker is taking advantage of additive manufacturing, which enables customers to customize the size and color of their lamps. They can also decide if their own personal Hanni will be the type that hangs or stands. The standard version of Hanni (which measures around 25 x 20cm) costs €49.

The idea for enabling customers to create their own lamp came from an Urbanmaker employee who, upon moving into a new apartment and failing to find the right lamp, simply designed and printed his own.

»In the future, we want to sell the lamp through an online shop, as well,« explains company co-founder and co-CEO Juri Boos, who's also proud of the fact that Hanni is made from recyclable PLA (a bioplastic based on corn starch).

Urbanmaker's eight-hour printing process is demand-based and runs overnight; the rough surface of its lampshades is created by design in just one layer of PLA using optimized manufacturing techniques.

In producing Hanni, the restless young entrepreneurs guiding at Urbanmaker have since moved on from the major manufacturers' standard printers. Their lamps are now created by a beri-boy – a 3D printer that was developed in cooperation with another Münster company, Feintechnik Rittmeyer. »By switching to this machine, we've unlocked further potential for our own printing variations and filaments,« Boos reports.

Meanwhile, Urbanmaker's core business isn't actually in designer lamps at all, but in solutions for industrial customers. Here, the Münster start-up develops prototypes, manufactures small series, optimizes established process chains, and implements additive solutions in industrial settings.

INDUSTRY NEWS

3D-PRINTED PARTS NOW STANDARD AT MAN

MAN Diesel & Turbo has begun incorporating 3D-printed components into its gas turbines. »We're the first manufacturer in the world to use complex 3D-printed metal components not only in test runs, but in series production, as well,« reports CEO Dr. Uwe Lauber.

To tap into this technology's full potential, MAN Diesel & Turbo is also investing in the MAN Center for AM – a hub of experts in multiple products and locations based at the company's turbomachinery plant in Oberhausen, Germany. At »MANCAM«, design specialists, material engineers, and production technicians are working together on extending the benefits of additive manufacturing to further components and products, including compressor impellers and fuel injectors for engines.

»We're currently investing around €2.6 million in leveraging the advantages of AM all along the value chain,« reports Dr. Roland Herzog, head of material technology within MAN's turbomachinery division.

According to Herzog, additive manufacturing presents tremendous potential for the MAN Diesel & Turbo product portfolio, especially in the production of gas turbine components. »The 3D-printed guide vane segments we've just started incorporating into our MGT6100 gas turbines have proven to be particularly suitable,« he adds. Herzog goes on to describe how MAN approved the use of AM technology in series production following extensive collaboration with highly specialized suppliers and development partners, including the Fraunhofer Institute for Laser Technology.

TO THE TUNE OF €100 MILLION: A MAJOR INVESTMENT WILL MAKE GERMANY THE CENTER OF GE'S ADDITIVE MANUFACTURING EFFORTS

GE and Concept Laser are pouring around €100 million into the growth of industrial 3D metal printing. By early 2019, this is to result in the establishment of a new 3D campus and 700 jobs in Lichtenfels, Germany. GE is hoping the commitment will solidify its position as the global market leader in this new field of industrial production.

Concept Laser has announced that ground will be broken on the future site of the 3D campus at a new location in Lichtenfels in the fall of 2017. Spanning some 35,000 square meters, these facilities will combine R&D activities with production, service, and logistics under a single roof. When they open their doors in early 2019, Concept Laser's headquarters in Lichtenfels will have evolved into GE's global center for the development of 3D metal printing technology.

»At the same time, the 3D campus will not only preserve, but strengthen our company's entrepreneurial spirit and start-up culture,« states Frank Herzog, founder and CEO of Concept Laser. »I'm very excited that GE is taking real action to back up its commitment to helping our Lichtenfels location grow.«

Right now, GE is already using 3D metal printing technology to produce series of various aviation components. Counting its acquisition of majority stakes in Concept Laser and Arcam, the company has invested more than U.S.$1.5 billion in additive manufacturing. »Our investment in an additional location for Concept Laser is part of our long-term strategy for future production methods,« says Mohammad Ehteshami, vice president of GE Additive.

Concept Laser's new 3D campus in Lichtenfels, Germany

Photo: Concept Laser

INDUSTRY NEWS

»CHANGING THE LAWS OF METAL PROCESSING«

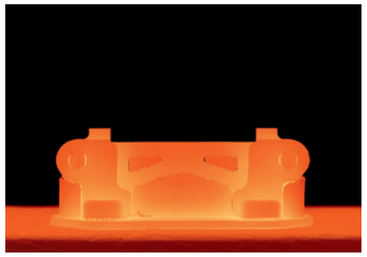
The numbers alone could represent a new milestone in 3D metal printing: In achieving production speeds up to 100 times faster than anything seen before, Desktop Metal says that it has made mass production economically viable in this field.

Based in Burlington (Massachusetts), USA, the company has unveiled two systems designed to cover the entire production cycle in both prototyping and series manufacturing. According to Desktop Metal, these units are capable of producing at a rate of 8,200 cm3 per hour – 100 times faster than conventional 3D metal-printing systems, in a leap that is »changing the laws of traditional metal production«.

Serving as the foundation of these systems is Single Pass Jetting (SPJ) technology: Here, parts are first formed using a mixture of metal powder and binding material in a proprietary process Desktop Metal has dubbed »bound metal deposition«. The parts are then sintered in a fully automated oven at temperatures up to 1,400° (C). Among other advancements, Desktop Metal is promising major simplifications thanks to integrated software that facilitates seamless printing based on CAD data.

Since its foundation in October 2015, the American company has received U.S.$97 million from its investors, which include GV (formerly Google Ventures), BMW, GE, Saudi Aramco, and Stratasys. Its workforce, now more than 100 employees strong, has submitted applications for more than 138 patents. The team that founded Desktop Metal includes MIT professors and thought leaders in the AM industry. The DM Studio System is scheduled to be available for delivery in August 2017, with the DM Production System following in early 2018.

» For further information and videos check out fon-mag.com



Photos: Desktop Metal (above), Autodesk (right)

AM INDUSTRY ACHIEVES 17.4% GROWTH IN 2016

According to the Wohlers Report 2017, the 3D printing industry grew by 17.4% last year while reaching a market volume of U.S.$6.063 billion. The report cites the less dynamic developments seen at the industry's largest manufacturers as the reason for the significant decline in momentum compared to the previous year (25.9%). Without these companies, the rest of the industry grew by around 25%.

In addition, the report (which comes from the consulting firm Wohlers Associates) describes the level of competition on the market as constantly rising: While there were 49 manufacturers selling AM systems in 2014, Wohlers notes that the number had already risen to 97 last year. It adds that the resulting competitive environment is new to the industry.

In compiling its 344-page report, Wohlers Associates surveyed 100 service providers and 80 manufacturers of AM systems and materials.

Terry Wohlers has already reported on the AM industry's considerable dynamism at the formnext conference powered by tct.

3D-printed prosthetics for professional athletes: Right now, lightweight prostheses created using 3D printers are enabling athletes with disabilities to accomplish extraordinary things. Shorter production processes are making it possible to set new personal bests both quickly and effectively despite their physical limitations. To learn more about how additive technologies can open the door to constant performance gains and change people's everyday lives – especially for small children with disabilities – simply read on.

IN FOKUS: QUALITY OF LIFE IN A NEW DIMENSION

How 3D printing technology can profoundly change the everyday lives of people with disabilities

Emma proudly shows off the Mecuris FirStep 1.0 in front of a mirror

Emma is a cheerful four-year-old who loves to dance, climb, slide, and generally romp around with others her age. For little ones like her, simply having fun without a care in the world is a big priority. For Emma, however, it wasn't always that way. Since she was born, she's had to deal with a disability: Amniotic band syndrome, a congenital disorder caused by the entrapment of fetal parts in fibrous amniotic bands, constricted Emma's to the ankle joint and some of the toes of her left foot while she was still in her mother's womb. Luckily, Emma is a fighter by nature. At just six months, she received her first prosthesis – one that was produced using a highly complex plaster-printing procedure and cost a good deal more than those made for adults.

PROSTHETIC CARE CURRENTLY PROBLEMATIC FOR CHILDREN UNDER FIVE

It turns out that providing prostheses to children five and younger is extremely difficult, as Emma's dad René Siebenlist explains: »If you ask me, there are issues in how people are educated and advised on prosthetics and orthotics,« he says, adding that he believes insurance companies have a particular responsibility in this regard (despite the welcome fact that such cases are relatively rare). Siebenlist also cites the experts who bemoan the lack of a specific ISO norm covering the size of children's feet. All in all, the situation was one that Emma's parents refused to accept. Believing that 3D printing technology could offer their daughter a higher quality of life, they followed the advice of their orthopedic specialist in turning to a newcomer in the field – Mecuris GmbH. Since mid-2016, this Munich-based company has been working to address the problems at hand with its FirStep model, which is designed to provide tailored prosthetic care to small children.

CUSTOM-FIT PROSTHESES FOR CHILDREN OF ALL AGES

»Thanks to an additive manufacturing technique using selective laser sintering of synthetic (polyamide) powders, we were able to design and print a custom-fit prosthesis for Emma based on an entirely parametric CAD model of her foot,« reports Manuel Opitz, CEO of Mecuris GmbH. »Our 3D printing partner mainly uses machines from EOS – the P395/396 and P760/770, for example, which make it possible to produce an entire artificial leg of a single piece in a horizontal process.« »

Text: Carolin Manggold

Photos: Mecuris GmbH (left), Optimus GmbH (right)

Mecuris FirStep 1.0

Peak performance with additive technologies

And Emma isn't the only one excited about the »new pink foot« that was 3D-printed just for her.

FIRSTEP 1.0 WINS OVER DESIGN AWARD JURY

Mecuris's model also stood out to the prominent jury members tasked with choosing the winner of the Purmundus Challenge design award at formnext 2016. In this competition, 18 finalists from all around the world presented their distinguished designs under the theme »3D Printing for the Mobile Individual«. Mecuris GmbH ended up taking home the highly sought-after golden trophy for the forward-thinking concept behind FirStep 1.0.

Those responsible for it have plenty of reasons to be proud of their 3D design. Manuel Opitz explains how the latest 3D printing technology can fundamentally change the lives of many children, along with their sense of self-esteem:

»We really believe that kids who have had amputations are entitled to take their first steps with confidence,« he says. »That means providing them with care that's not only functional, but appealing, as well. We wanted to come up with something attractive and age-appropriate that we could show to the world; the Purmundus Challenge offered an excellent platform for doing just that.«

Equipped with additive manufacturing techniques and the digital quality controls they afford, Mecuris is promising to bring prosthetic care to children in ways that have never been seen in mass production.

»On our platform, we can use image data to design prostheses in the cloud and then have them printed on-site,« Opitz offers. »Instead of replacing the experts involved, it makes them up to 400% more efficient, meaning they can focus on their patients rather than on the production side.«

Paralympian Denise Schindler with her 3D-printed athletic prosthesis

3D PRINTING ON-DEMAND CAPABLE OF BOOSTING PRODUCTIVITY BY UP TO 400%

Meanwhile, Emma and her parents are thrilled with how quickly this additive technology can create a prosthetic foot right when she needs one. On-demand care of this kind presents a number of other big advantages, too, including all the trips they no longer have to take to their orthopedic technician.

It's also important not to underestimate the cost factor at hand: According to Opitz, health insurers provide less coverage for children's feet than for adults. And since Emma can't seem to stop growing, she needs a new prosthesis every three to six months. In the past four years, a total of seven have been produced for her. Mecuris states that the 3D-printed variant makes it possible to provide even more tailored care to children of all ages – and even more importantly, it can be created within a week at a lower cost than in conventional production. The company also reports that the carbon- or glass fiber spring built into its models provide for the same good energy-return characteristics available in some expensive prosthetic feet for adults.

For Emma, this means that each new year brings new opportunities to live more independently and follow her dreams without being held back by her disability.

Thanks to her 3D-printed prosthesis, »Emma can interact with others on the same level,« says father René, who adds that she has indeed become more independent.

A NEW SENSE OF FREEDOM STRAIGHT FROM THE 3D PRINTER

Another person who has grown familiar with this newfound feeling of independence is 31-year-old Paralympic medal-winner Denise Schindler. After losing her right lower leg in an accident at the age of two, Schindler began relying on her own prosthesis, which has now also been supporting her professional athletic activities since 2010. Her interest in blazing new trails for other athletes with disabilities is a big part of why she keeps striving for technical perfection.

ADDITIVE TECHNOLOGIES TAKING ATHLETIC PERFORMANCE TO NEW HEIGHTS

This general effort is focusing in particular on 3D-printing technology, as Schindler explained as a keynote speaker at last year's formnext powered by tct conference in Frankfurt am Main. In additive manufacturing, the cycling world champion sees a breakthrough that's »opening the door to a self-determined life for athletes with disabilities«.

Along with Autodesk, an American software company specializing in 3D design; and her own prosthetic manufacturer, Reha-Technik Wellmer, Schindler initiated a process she hoped would further her sporting career around two and a half years ago. Her goal? Adding more medals to her collection at the 2016 Paralympic Games in Rio de Janeiro. Taking herself as an example, Schindler illustrated how additive technologies make peak athletic performances possible – including her own silver-worthy effort in last year's cycling time trials. Several companies were involved in fine-tuning the ideal athletic prosthesis for her. The process began with a laser scan that took precise digital measurements of the amputation point on Schindler's right leg. Paul Sohi, an Autodesk product designer from London, then used the software Fusion 360 to create a corresponding model, after which it took just a day for the prosthesis to be fabricated by a Stratasys Fortus 450 MC printer at Autodesk's Pier 9 workshop in San Francisco.

AROUND THE CLOCK, AROUND THE WORLD

In total, more than 20 people worked on the project from across the globe.

»The most exciting thing about this endeavor was that experts from all around the world were involved, and that we could contribute no matter where we were,« Schindler affirms. She goes on to describe how the ability to access the necessary software in the cloud made times and locations irrelevant, which in turn led to a less complex and time-consuming digital manufacturing process. According to Schindler, the project team also had more freedom to experiment with the design and incorporate aerodynamic aspects in a more precise fashion. Here, she also had the support of the Berlin-based institute FES, which researches and develops sports equipment. The Autodesk software Within was also used to help keep the prosthesis as light as possible.

PRO SPORTS PROSTHETICS POSSIBLE IN 48 HOURS THANKS TO »DIGITAL PLASTER CASTS«

While manually produced prosthetics can take weeks to manufacture and require quite a few trips to an orthopedic technician, Schindler reports that it takes just 48 hours to produce her athletic prosthesis from polycarbonate. She explains that the process is based on a »digital plaster cast that lasts forever«, which makes it possible to apply any necessary changes digitally and adapt the prosthesis to specific stress tests during her training. This aspect is key, especially when it comes to preventing infections in her right leg.

Already squarely focused on her future, Denise Schindler believes plenty of potential remains untapped in 3D printing technology. She plans on being more prepared and motivated than ever to put some gold next to her silver and bronze medals at the 2020 Paralympic Games in Tokyo. When the time comes, she'll have an even better, more customized 3D-printed prosthesis to rely on.

Schindler wants to encourage people with disabilities – especially little ones like Emma – to believe in themselves, take on challenges, and live their dreams. »If I can be an inspiration to them, even better,« she adds.

The example she has set could also help Emma forge down new paths with the help of digital 3D-printing technology. The four-year-old continues to receive support from Mecuris, which has already developed an improved version of her prosthesis (FirStep 1.1) and will continue to calibrate its new creative design processes going forward.

In particular, Manuel Opitz believes that the additive manufacturing of prostheses will be more the norm than the exception in just a few years, which should lead to significant opportunities. »We've already seen encouraging signs from other areas of medical technology, including the first 3D-printed implants on the market,« he reports. »Surgeons are already practicing operations on anatomical models produced using additive processes; 3D printers are manufacturing more and more hearing aids and dental implants, as well. And this is just the start of a trend whose scope we can hardly define at the moment.«

Denise Schindler's cycling prosthesis

Photos: Autodesk

+ FURTHER INFORMATION:

» fon-mag.com
» mecuris.com
» denise-schindler.de

TALKING ABOUT

»NOT A REPLACEMENT – A SENSIBLE ADDITION«

Arburg's freeformer represents the company's first foray into the world of additive manufacturing. To discuss the technologies and other innovations coming from this family-run Swabian concern, we sat down with Eberhard Lutz, who heads the freeformer sales department.

Interview: Thomas Masuch

Photos: Arburg

The main advantage of our open system is that users can opt for lots of different amorphous injection-molding granulates to produce not just mockups, but real functional components.

Mr. Lutz, Arburg is a traditional mechanical engineering company. Could you describe what makes it different from purely »additive« companies? Where are these differences most apparent?

LUTZ As a family-run German firm with a great deal of expertise in plastics, our customers' long-term success is more important to us than selling our machines as quickly as possible. That's why we only deliver to those regions of the world where we can guarantee our proven level of service. In technological terms, I think the biggest difference – along with our openness to various materials – lies in the quality of our machines. For freeformer, we use a lot of high-quality components that also go into our injection molding machines, such as control boxes, plastification units, and control systems. We develop and manufacture the key components of our machines at our main production location in Loßburg. Since we've enabled freeformer to produce the same quality we've achieved in mechanical engineering, it's offers a much higher level of component precision than conventional 3D printers.

How do you ensure a certain level of repeatable quality when customers can use whatever materials they want?

LUTZ In »batch-of-one« additive manufacturing, the predictability of a component's quality characteristics is a major topic in general. Component quality depends on a range of variable slice and process parameters, after all. In the additive manufacturing of »real« functional components, mechanical factors like tensile strength, tear resistance, and density – or changes in the chemistry of base materials – are of central importance. Every material used with freeformer is certified in advance, which is how we calculate our pre-optimized process data. To build quality parts, working temperature and temperature resistance are also essential. Many customers handle that themselves, but we're happy to support them with our extensive database on ABS, PA 12, PC, TPU, and other materials.

What gave Arburg the idea to get into the additive space, and how did the industry react?

LUTZ The first rumblings about producing synthetic parts without molds started at Arburg back in 2004. In recent years, requirements have been trending toward shorter product life cycles, increased variant diversity, and the desire for customized products. The idea of »flying plastic droplets« led to some initial concepts and basic experiments, which then resulted in patent applications for the Arburg Plastic Freeforming (APF) process. Our cooperation with a renowned university in the field of droplet generation began in 2007; three years later, we produced our first components. After unveiling freeformer for the first time in 2013, we started selling it around the world in 2015. The industry was thrilled to see a mechanical engineering company like Arburg, which also knows everything there is to know about working with plastics, get into additive manufacturing and bring a machine to market.

What kind of savings can users expect when it comes to prices?

LUTZ One big advantage of freeformer is that it works with certified standard granulate and generally doesn't produce any waste. It's also possible to wash off any support material. The types of granulate in question, which are also used in injection molding, cost just a fraction of what rolls of plastic filament do, for example. Plus, our waste-free system needs very small amounts when working with expensive special materials.

Should users do their own shopping, or bring in a consultant or service provider? Does the option to choose your own material come with any other advantages?

LUTZ Among other things, that depends on how much you need of a given material. Customers from the injection molding industry generally have their own material on hand, which they can also use in the APF process as long as it's clean and dust-free. As I mentioned, the main advantage of our open system is that users can opt for lots of different amorphous injection-molding granulates to produce not just mockups, but real functional components. The »

At Arburg's new prototyping center, six freeformer units produce component prototypes to fulfill customer requests.

About Arburg
Arburg, a family-run German company, is one of the world's leading manufacturers of machines designed to process plastics. It operates in 33 locations in 25 countries through organizations it owns, and in more than 50 countries through various trade partners. Arburg's production activities, however, take place solely at its core plant in Loßburg, Germany. The company employs some 2,200 people in its home country, and around another 500 at its organizations abroad.

items we've produced with freeformer include electrical plugs made of a fireproof PC/ABS blend, implants made of medical PLA, and air ducts made of PC that's certified for aerospace applications. These are things conventional 3D printers can't do.

How much of a priority is the APF process at your company?

LUTZ We see a lot of future potential in freeformer, and we're expecting additive manufacturing to grow even more important in general. That's why the APF process is going to be an integral part of our executive strategy going forward. As an area, it falls within the technical purview of Dr. Eberhard Duffner, who's also responsible for our entire development division. Meanwhile, I'm the department head responsible for selling freeformer around the world. This configuration underscores how important additive manufacturing is to Arburg's future strategy.

What's the ratio of start-ups to more traditional companies among Arburg's customers?

LUTZ Well, freeformer is especially interesting to those who use a variety of materials, can and want to work with an open system, and have expertise they can employ in working with plastics and special basic materials. It's amazing how many of our traditional customers in injection molding have a need for machines that produce small batches and individual components. Those who work with plastics are using more additive techniques in their own manufacturing, as well – as a fast, flexible means of producing operating equipment like assembly fixtures and gripping devices for automation purposes, for example. In addition, freeformer has met with a lot of interest from well-known universities and research institutes, along with various material manufacturers. Start-ups are a rather marginal group within our customer base.

Do your customers see freeformer as more of a supplement to their existing machinery, or are there some for which freeformer is replacing traditional injection molding in some cases?

LUTZ 3D printing technology is opening up new possibilities in the processing of plastics and finding its way into industrial applications. Interest in freeformer continues to grow – not only in Europe, but in the United States and China, as well. Custom-made plastic components for consumer products, medical implants, and functional spare parts are just a few of the many areas for which our open additive-manufacturing system is a perfect fit. That said, freeformer and additive manufacturing in general won't replace injection molding in the next five, 10, or even 50 years. What it will be is a sensible addition to conventional techniques.

Arburg just recently opened its own center for creating prototype components. How long does it usually take to reach the testing phase and deliver a machine after a request is received, you might ask? How does this process generally play out?

LUTZ Well, two phases are involved: The first involves creating the prototype component to determine whether it meets the requirements at hand and is suited to freeformer. After that, an order can be placed. The time required for delivery depends on the customer and how busy we are in production and assembly at that moment. We can complete the entire process in the space of three months, though.

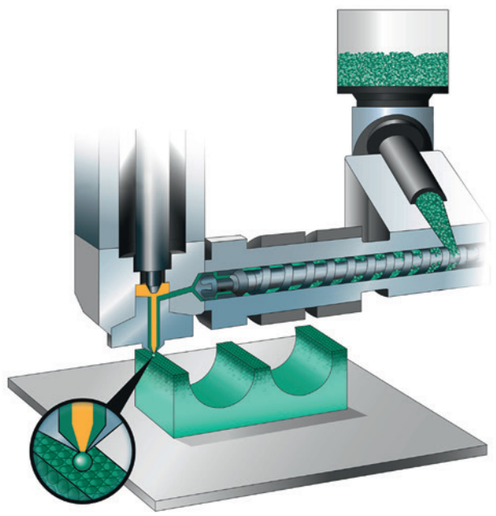
Before we go, could you give us a few examples of how products are customized?

LUTZ Well, in trackable »smart« products, we've showcased things like personalized office scissors, light switches, and luggage tags. In each case, freeformer customizes an injection-molded variant that's normally produced in large quantities by using an additive technique to apply a plastic graphic or set of letters selected by the customer as 3D geometry. In medical technology, we've created individually fitted implants and ortheses, as well as models for operation preparations. One of the innovative materials we use there is resorbable polylactide (Resomer PLA), which dissolves in the body after a certain amount of time.

Mr. Lutz, thank you for taking the time to talk with us.

FURTHER INFORMATION:
» arburg.com
» fon-mag.com

The Arburg Plastic Freeforming (APF) process makes it possible to produce functional components from certified standard granulate. At formnext 2015, the »Nautilus Gear« was manufactured from fireproof PC/ABS using additive techniques.



droplet function
Arburg's freeformer applies melted plastic granulate to a given substrate in droplet form. The temperature in the modeling area is adapted to the material in question to optimize the droplet agglomeration process. »This enables us to achieve stability levels corresponding to 80-90% of what we see in injection molding,« Eberhard Lutz reports. The two application units in freeformer make it possible to create a support structure or produce components using two different materials or colors.

TURNING REFUSE INTO SPARE PARTS

A research team from the Deakin University School of Engineering (Australia) is showing how to take on two of our planet's problems at the same time. Its members have developed a 3D printer designed specifically for developing regions that processes waste plastic into components for hygienic and sanitary purposes, among other uses.

The empty bottles and other plastic refuse they are shredding in the 3D Wash project are being turned into rolls of filament. In the first phase of the project, this filament is being used to produce spare parts for water supply systems. The 3D printer in question runs on solar power, which makes production possible in very remote locations, as well.

The team behind 3D Wash is currently planning to conduct a trial in the Solomon Islands. »If we make this technology dependable enough, it could also be used in a variety of other areas,« points out team leader Dr. Mazher Mohammed.

A VIRTUAL LEGACY LIVES ON

In recent years, the UNESCO World Heritage Site at Palmyra (Syria) has been taken over twice by the terrorist group IS, which has gone on to destroy numerous cultural treasures. The #NEWPALMYRA project now wants to employ cutting-edge scanning technology and 3D printing to preserve the cultural heritage of the city, whose history reaches back more than 2,000 years.

At the recent Creative Commons Summit in Toronto, the team behind this effort unveiled its version of the Tetrapylon, which was one of Palmyra's most famous monuments before its unfortunate destruction. The two-meter-high, 3D-printed replica was created based on data collected by the #NEWPALMYRA project. The Texas company re:3D was tasked with printing the 91-kilogram reproduction, a process that took 800 hours.

The #NEWPALMYRA project was initiated back in 2005 by 24-year-old Bassel Khartabil, a Palestinian-Syrian software developer. Khartabil and his team managed to virtually reproduce many of Palmyra's cultural monuments before he was arrested by the Assad regime in 2012. Evidence now suggests that he was eventually taken to an unknown location and murdered. Since then, #NEWPALMYRA has continued as a non-profit organization run by Khartabil's family, friends, and a community that makes constant use of the project's virtual models.

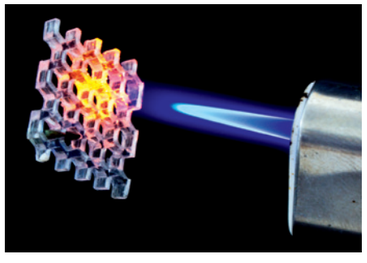
»We want to continue to promote cultural understanding by making this data available and encouraging people to use it,« states Barry Threw, interim director of #NEWPALMYRA. The 3D model of the Tetrapylon, for example, is available for viewing and further use under a CC0 license.

The restoration of cultural monuments using 3D printing is enjoying widespread support, as Italian experts recently demonstrated in reconstructing partially destroyed burial busts made of nearly 2,000-year-old limestone.

» For further images, check out fon-mag.com

Photos: Deakin University School of Engineering (above), #Newpalmyra

Photos: NeptunLab/KIT (above), SpaceX (right)



3D PRINTING ALSO POSSIBLE WITH GLASS

A technique developed at the Karlsruhe Institute of Technology (KIT) is facilitating the printing of glass for the very first time. Thanks to its transparency and resistance to heat and acid, glass could open the door to many new applications, including in optics, data transmission, and biotechnology.

The procedure, which was developed by an interdisciplinary team led by mechanical engineer Dr. Bastian E. Rapp, blends nano-particles of extremely pure quartz glass with a small amount of liquid plastic and hardens the substance at specific points using stereolithography. The material left over is washed out or removed through the application of heat. »In the final step, the glass is sintered to the point that the glass particles melt together,« Rapp explains.

Rapp adds that glass formed using 3D techniques can be incorporated into data technology, as well. »Two technological generations from now, computing will be based on light, which requires complex processor structures,« he reveals. Meanwhile, minuscule analytical systems can be assembled from tiny glass tubes for use in biological and medical technology. Other glass microstructures created using this procedure could see use in a wide variety of optical applications, from glasses for special requirements to the lenses of laptop cameras.

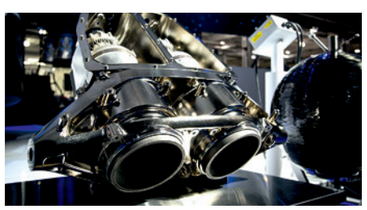
» For further images, check out fon-mag.com

AM REDUCES THE GAP TO THE MOON

If everything goes according to Elon Musk's ambitious plans, the Dragon space probe will already start ferrying its first private passengers to the moon in 2018. While it won't land directly on the lunar surface as the Apollo 17 mission did 46 years ago, it will at least trace a path around Earth's natural satellite.

Musk's company SpaceX has already made history in the aerospace sector by developing a rocket stage capable of returning safely to Earth. Dragon's planned trip to the moon would be another such breakthrough – one made possible by additive manufacturing. The combustion chambers of its SuperDraco engines, for example, were produced using 3D printers from EOS before undergoing successful testing over the past two years. In the most recent trials conducted at the SpaceX development center in Texas, this propulsion system was successfully test-fired a total of 27 times. (A video is available in the online version of fon-mag.) AM has also helped SpaceX made its production activities more flexible and cost-effective in general.

SuperDraco is the more advanced successor to the Draco engine, which is already enabling the Dragon cargo module to maneuver in space and when reentering Earth's atmosphere. Before setting course for the moon, the second iteration of Dragon will depart for the International Space Station, and passengers will already be on board. This is to be the first of four Dragon V2 flights scheduled to launch each year. SpaceX's plans to send a Dragon capsule to Mars in 2018 before the first voyage with humans will start as soon as 2024.



OUTSIDE THE BOX

Not Just a Matter of Taste

Generally speaking, technological revolutions – from the stone axe, the wheel, and the steam engine all the way to the Internet – have helped improve our quality of life since the dawn of human history.

Just recently, we received word of an American company with the modest goal of »revolutionizing how food is made«. This firm, Beehex, had announced a partnership with Cali'Flour that will be seeking to 3D-print a vegan pizza crust.

It bears recalling that pizza originally comes from Naples, Italy, which is likely still the place where one can tuck into the very best. Instead of vegan offerings from a 3D printer, however, you'll most often find good old marinaras and margheritas. Even native Napoletans are willing to wait for half an hour outside of the best restaurants for that classic blend of flour, cold-pressed olive oil, sea salt, southern Italian tomatoes, garlic, and oregano.

Meanwhile, the revolutionary aspect of the American pizza printer will probably not be the tastes it produces, but the potential to use it in large-scale kitchens or highway rest stops. Look up »revolution« in the dictionary and you'll find that it results in fundamental, long-term change. There's nothing in there that says the resulting conditions are always better.

Not everything that's marketed as revolutionary actually shakes up the world, after all. In the case of pizza, we're still free to decide that the pies our favorite Italian restaurants pull out of the oven based on centuries-old traditions are actually the better choice.

Text: Thomas Masuch , Illustration: iStock.com/LenkaSerbina

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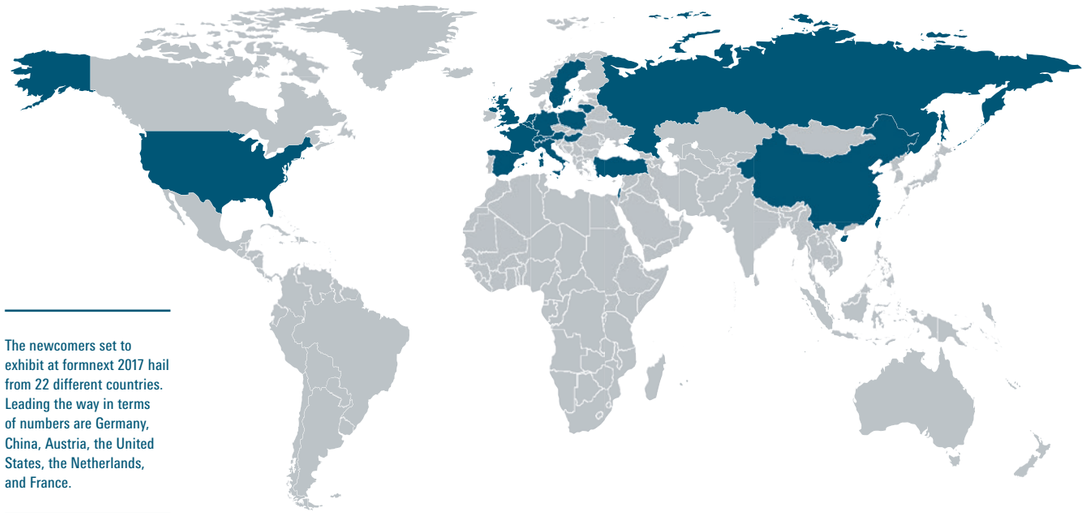
NEW EXHIBITORS FROM AROUND THE WORLD



The newcomers set to exhibit at formnext 2017 hail from 22 different countries. Leading the way in terms of numbers are Germany, China, Austria, the United States, the Netherlands, and France.

IMPORTANT FACTS:

» 14 – 17 November 2017

» Messe Frankfurt, Hall 3

» Further information: formnext.com

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