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formnext magazine



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Clinging to the past
can be costly
because the rules
have changed.

[Terry Wohlers, president of Wohlers Associates]

Cover : icl berlin

EDITORIAL

Some women claim that we men never grow up. Admittedly, there are times when they're not entirely wrong about that. In defense of the male species, however, I'd like to point out that people in general – unlike many other living creatures – do take quite a while to develop into adults.

Horses figure out how to walk just a few hours after being born, while humans usually need a year or more. If you put any stock in the related research, this is mainly due to the size of our brains. In a larger brain, reaching a mature state takes longer for the area or network that handles coordinated movements. Or take gray seals, for example, which are left behind by their mothers just three weeks after their birth and start hunting for themselves. Our kids are sometimes still stretching their feet out onto the coffee table at home even when they're almost 20!

In the eyes of the law, turning 18 makes you an adult in Germany, but it actually takes a fair bit longer for the brain to develop. Researchers at Harvard University have discovered that parts of the human brain don't reach full maturity until our thirties.

All that said, there is something attractive and justifiable about not wanting to grow up. Being an adult does imply that one's development is complete, after all, and in today's business world – particularly in an industry as dynamic as ours – who can afford to stop evolving? Young AM companies quickly need to hone their own

»hunting« skills as they learn how to attract customers with compelling products. At the same time, however, it's important that they do not advance too quickly and end their dynamic growth before the time is right.

In this issue, we take an in-depth look at Dyemansion (page 08) and Trumpf (page 12) as examples of companies that are keeping their youthful momentum going. As important as it obviously is to be professional, we always want formnext to be open to new developments, as well. We're looking to keep growing along with this exciting industry without becoming overly grown-up.

As always, we're happy to have you along for the ride and hope you enjoy reading this edition of formnext magazine.

Sincerely,
Sascha F. Wenzler
Vice President formnext



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FORMNEXT NEWS

FORMNEXT ON TRACK FOR FURTHER SUCCESS: 50% INCREASE IN REGISTRATIONS COMPARED TO SAME TIME LAST YEAR

Judging by the flurry of activity surrounding the event, formnext is set to continue its successful run. The number of exhibitors, who have already registered, has grown by 50% compared to the same period last year, as has the amount of reserved exhibition space.

Additive manufacturing is currently one of the most important upcoming subjects for companies in numerous industries. This is underscored by the fact that both emerging start-ups and long-standing, yet innovative corporations are finding out what formnext can offer them. As of mid-April, 100 new exhibitors from 20 countries had already registered for formnext 2018 – including prominent international groups such as Clariant, Mitsubishi Chemicals, and Solvay. Carbon 3D, a world-renowned start-up from Silicon Valley, will also be unveiling its latest innovations at the exhibition in Frankfurt.

CONFERENCE IS AGAIN HUB FOR THE EXCHANGE OF AM INDUSTRY-KNOWLEDGE AND INNOVATION

TTCT, formnext's content partner, is also organizing another high-quality conference

program that will bring the AM industry's leading minds together with industrial users during the exhibition. The conference's exciting presentations will highlight current and upcoming developments in the fields of research and industry while offering key inspiration for the future.

CONCRETE BUSINESS OPPORTUNITIES AT THE FORE

The rise of additive manufacturing and the ever-increasing number of related uses are leading more and more companies to focus on tangible business deals as they search for worthwhile applications and business cases across a variety of sectors. »Additive manufacturing and its leading exhibition have matured together and become an integral part of the associated industry,« states Sascha F. Wenzler, Vice President for formnext at Mesago Messe Frankfurt GmbH. This progress was already evident at formnext 2017, where many companies succeeded in completing numerous deals that accounted for a significant portion of their annual order volume.

SCOPE OF SUBJECTS CONTINUES TO EXPAND

This year, formnext's successful development is poised to continue as it expands to cover an even wider range of topics along the relevant process chains. »Part of this involves our effort to present the entire process chain in modern industrial production in an even more condensed and comprehensive way,« Wenzler explains. Along with the already highly advanced areas of AM (including hardware and materials), software and post-processing (for powder removal, surface finishing, and heat treatment, for example) and complex industrial tool-making are to receive increased attention in 2018. »Industrial additive manufacturing requires a broad spectrum of activities, from design, work preparation, and forming processes to surface finishing and quality assurance,« Wenzler affirms.



Photo: Mesago/Thomas Klerx

INDUSTRY NEWS

YOUNG AM COMPANIES DRIVING COMPETITION AND SALES TO A NEW LEVEL

Even after almost three decades, the world-wide AM industry has lost none of its momentum and again achieved a growth rate of more than 20 percent in 2017. According to the recently published Wohlers Report 2018, additive manufacturing generated global sales of \$ 7.336 billion last year (+21.0 percent compared to 2016). For the next few years, Wohlers Associates expects sustained growth of more than 20 percent: as early as 2023, the global market is expected to nearly quadruple to around \$ 27.3 billion.

»Sales from system manufacturers relatively new to the AM industry contributed to overall industry growth«, says Terry Wohlers, president of Wohlers Associates in an interview with the formnext magazine. Products from these companies are generally less expensive than some of the established machines, and most are open to a wide range of third-party materials. »Consequently, they are driving competition to a new level.«

In the new 344-page report, Terry Wohlers and 80 authors in 32 countries describe the

latest developments of various technologies and the most important companies in the industry. The content shows that the dynamic growth of the entire industry is reflected differently by the individual companies: Especially with the already »traditional« AM companies, such as Trumpf, Concept Laser and EOS can continue their growth over the years while others have stagnated.

»One reason is their neglect for the »golden rule« of product development. If you do not obsolete your own products, someone else will«, explains Terry Wohlers. »Clinging to the past can be costly because the rules have changed, especially as AM transitions into production applications.«

The focus on manufacturing has apparently meant that since 2010, the average price of industrial 3D printers has risen from around \$ 65,000 to around \$ 100,000. Wohlers Report 2018 cites two reasons for this: Firstly, high-end metal AM systems began to sell well. The second reason is that the popularity of good quality desktop 3D printers (under \$ 5,000 and therefore not included in this statistic) has led to a decline in sales of some industrial systems in the range of \$ 10,000 to \$ 30,000.

Of the 14,736 industrial 3D printers installed last year, 1,786 were metal AM systems, an increase of 79.9 percent compared to 2016.



Wohlers Report 2018 explains this increase in part by several new manufacturers of relatively low-cost metal AM systems entering the market. This has also led to the average price of AM equipment in the metal sector falling sharply from \$ 551,585 (2016) to \$ 407,883 in 2017.

As a hotbed for young and innovative companies, Asia and especially China is becoming increasingly important. »We uncovered 24 manufacturers of industrial AM systems in the country, and many of them emerged over the past 12–18 months«, says Terry Wohlers. »Generally, the adoption of AM in Asia has lagged the U.S. and Europe, but now momentum is gaining in that part of the world.«



After relocating to the Berlin district of Marzahn, the glasses company ic! berlin incorporated elements of its new surroundings into its latest collection. Several of the frames in the »plotic goes urban« series feature the sandy grays of the flat concrete facades Marzahn's apartment buildings are known for and combine them with a clean, modern design. The »Utopia« model is featured on the cover of this edition. ic! berlin manufactures its glasses by 3D printing polyamide and applying colors with equipment from DyeMansion.

+ FURTHER INFORMATION ONLINE:

» fon-mag.com

Photos: Mesago / Thomas Klerx (on top), ic berlin (below)

INDUSTRY NEWS

A HOME FOR A DIGITAL AM TWIN

In the middle of Siemens' manufacturing plant in Erlangen, Germany – which mainly produces industrial drive and control systems for other factories – AM has become another part of the everyday routine. On April 10, 2018, the facility celebrated the grand opening of its new Additive Manufacturing Experience Center, which Siemens is using as a showcase for its digital solution portfolio for industrial 3D printing. Numerous user scenarios and the latest production technologies are also in display, including robot-aided 3D printing (or »multi-axis FDM«, as it is also known).

As one might guess, Siemens wants the Additive Manufacturing Experience Center to be a place where customers can get a real taste of industrial 3D printing. »We want to show mechanical engineers and operators what digitalization means for the AM sphere,« affirmed Dr. Wolfgang Heuring, CEO of the Motion Control (MC) business unit within Siemens' Digital Factory division.

This was why one of the terms heard most often at the event was »digital twin«, which

refers to how Siemens is providing a digital environment for all the production steps in additive manufacturing. According to Dr. Heuring, this makes it the only company in the world that »offers a holistic approach« to digitalization.

For prototype production, the Additive Manufacturing Experience Center has a Laser-tec 65 3D hybrid from DMG Mori and a multi-axis FDM system it developed along with Hage Sondermaschinenbau. It also plans to acquire further equipment that will make additional AM technologies available on-site.



MUCH CHEAPER THAN CNC MACHINING

At formnext 2017, more than a few ears pricked up at the announcement that the Swedish start-up Magicfirm Europe was planning to sell industrial 3D printers and filaments all around the world in cooperation with its Chinese partner, Shenzhen Esun Industrial. Now, Magicfirm and its 12 employees are ready to take the next step in producing a 3D metal printer for less than € 10,000.

CEO Mats Moosberg, who developed the new ZYYX printer, has promised that its price will include a complete system, along with sintering and binder-removal functions. This printer will also offer the advantage of using metal powder in a binder, which makes related security requirements much easier to meet. The further process steps involved in removing the binder and sintering the object at hand are similar to those followed in binder jetting.

»We think our metal technology will mainly be used in prototyping,« Moosberg revealed to formnext magazine. »That includes not only the production of individual parts, but tools and jigs, as well.« Moosberg also believes that the automotive industry could be one of ZYYX's key target groups, adding that the metal printer can produce components overnight at a fraction of the cost of CNC manufacturing. Those interested will have to be patient, however: Moosberg doesn't expect ZYYX to be market-ready until 2019.

+ INTERVIEW AT:
» fon-mag.com

START-UP CHALLENGE SEEKS BUDDING INNOVATIONS

Once again this year, young and innovative companies from the world of additive manufacturing can enter the formnext Start-up Challenge. Those that are no older than five years are welcome to register any time between now and 13 July 2018. This year's competition will recognize the most inventive and promising business ideas.

»DISCOVER3DPRINTING« SET FOR EXPANSION

The seminars in the »discover3Dprinting« series are designed to showcase the potential of additive manufacturing and make it easier for companies to start using this technology. Initiated at last year's formnext, the series is to continue in 2018 by highlighting subjects tailored to target groups at a number of other exhibitions, including PCIM (Nuremberg), Achema, and Automechanika (both Frankfurt). »discover3Dprinting« will then culminate at formnext 2018 in Frankfurt.

SUBMISSION PHASE OPENS IN PURMUNDUS CHALLENGE

The purmundus challenge, an annual international competition for innovative ideas in 3D printing, has kicked off for the sixth time. This year's purmundus challenge, which is being held under the theme »Preparing for the Future with 3D Printing«, is being supported by internationally renowned players in the 3D printing sector. The finalists will then be put on display as part of a showcase at formnext 2018.

FROM BASEMENT DYE EXPERIMENTS TO THE GLOBAL MARKET

Five years ago, young entrepreneurs Felix Ewald and Philipp Kramer were actually hoping to sell custom 3D printed smartphone cases. To this day, however, the founders of Dyemansion haven't sold a single one successfully. Instead, they've turned their start-up's focus to industrial dye and finishing applications, which has brought them international success. Providing Ewald and Kramer with a boost along the way was the formnext Start-up Challenge.

Upon hearing about 3D printing while they were still students, Felix Ewald and Philipp Kramer remember thinking, »That sounds pretty cool.« This gave rise to the idea to order smartphone cases from service providers and sell them to large companies from their home base in Munich. The cases, however – which were designed to match the corporate identity of each customer – often left traces of dye behind in users' pockets and were returned as defective. »That's when we had to make a decision: do something else entirely, or develop our own dye solution,« says Ewald, who holds a degree in business information systems.

SIX MONTHS FOR A SOLID BLACK

Just 23 and 25 at the time, the two tinkers spent several months exploring various

dye processes, contacting experts in the textile industry, and cooking up dye recipes in their Munich basement.

It took Ewald and Kramer about half a year to come up with a quality black pigment, which was to be the starting point for their production of colored cases. Around that same time, they attended a gathering of entrepreneurs in Munich and met Arno Held from AM Ventures, an investment company specializing in AM that was started by EOS founder Dr. Hans Langer.

A BIT BORED OF SMARTPHONE CASES

It turned out that Held thought the 3D printed case idea was »rather boring; there were already too many sellers back then.« What he was interested in was the dye used in the process. »I quickly realized that this could

be a solid business model,« Held reveals. He goes on to explain that there was only one provider of dye technology for sintered components at the time, and he hadn't found it convincing in technical or economic terms.

In the case of Ewald and Kramer, however, it was both their dye solution and the mentality of the two entrepreneurs that won Held over. This prompted AM Ventures to invest in Dyemansion, which financed its further technical and entrepreneurial development. The majority stake, however, remained with its two founders. The infusion of capital enabled Dyemansion (which had four employees back then) to unveil the first prototype of its dye system at formnext 2015. In typical start-up fashion, the unit was »finished on Monday and put on display at the exhibition on Tuesday«.

»THE BEGINNING OF THE END ...«

For their first exhibition appearance, Ewald and Kramer's main goal was to get their pilot phase rolling. »That meant we needed companies willing to work with us,« Ewald recalls. Dyemansion thus took part in the formnext Start-up Challenge, which recognizes young and innovative companies from the world of additive manufacturing.



Text: Thomas Masuch

Photos: Credit Yago Servatius (left), Maria Johannes (right)



Photo left: Felix Ewald
Photos this Page: Post-processing in three steps: after powder removal comes surface finishing, which provides a foundation for dyeing.



Photo on top:
Tibor Näther searches for the perfect dye solution at the DyeMansion lab.

Photo right:
The company's young team has grown quickly, and 20 more new employees are expected to come on board in 2018.

Within just a few days of the exhibition, it had not only won the competition, but secured handshake agreements to cooperate with four different organizations, as well. »That was the beginning of the end – the end of our lives outside of work, that is,« Ewald says with a laugh. Since then, Dyemansion has undergone rapid growth. It now delivers products to over 400 customers, including global players like BMW, Daimler, and the apparel company Under Armour, as well as Materialise and Shapeways – both world-leading service providers in 3D printing.

Meanwhile, formnext has continued to play a prominent role in the company's development, with Dyemansion presenting its latest innovations in Frankfurt every November since.

Along with its fully automated dye system, it has showed off a unit for powder removal and another for surface finishing. These offerings are enabling the young company to cover the cleaning, surfacing, and coloring steps of post-processing in an approach it calls the »Print to Product« workflow.

As Dyemansion has grown, so has the size of its booth at formnext. Now a well-established exhibitor, the company has built a solid reputation on both its many technical innovations and the quality booth parties it has thrown.

A LITTLE LUCK HARDLY ANY MISTAKES

Looking back, Ewald attributes Dyemansion's successful evolution to two essential factors. »For one thing, we were really lucky to meet the right people at the right time and place,« he admits. »We also didn't make many mistakes and rarely wasted money.«

While the 29-year-old reports that Dyemansion already began turning a profit in 2017, he doesn't see it in a position to consolidate or seek more measured growth at the moment. »There's a high level of demand for dye solutions around the world right now, and we need to address it before other companies start catching up,« he says. »People are looking for a holistic setup that produces high-quality parts.«

A GLOBAL OFFENSIVE

This is why continuing its international expansion is a key objective in the company's current and future advancement. Establishing a location in the United States, along with corresponding sales and service structures, will be an important step in this process. This is where Dyemansion is working closely with

Photos: Maria Johannes

There's a high level of demand for dye solutions around the world right now, and we need to address it before other companies start catching up.

partners like HP and EOS, the latter of which has even been including the company's products in its own portfolio since November 2017.

The fledgling start-up from 2013 has since witnessed some big changes as a company, as well. By the end of this year, it plans to increase its workforce from a current 28 employees to 50. »In the beginning, we just hired our friends,« Ewald concedes. »Now we need to follow proper management processes, even if it's not really our thing.«

NOT TOO BUTTONED-DOWN

»At the same time, we don't want to get too corporate,« Ewald points out. To keep things from getting too buttoned-down, Dyemansion has its own in-house cook and encourages employees to address one another by their first names. E-mail addresses at the company also do without last names. This also applies to affirmed industry experts like Kai

Witter, formerly the director of central sales at EOS, who is now busy taking Dyemansion's sales efforts global.

It's the laid-back character apparent in the company's culture that has inspired Witter. »The thing that excites me about Dyemansion is the atmosphere of absolute fearlessness,« he raves. »In my experience, the fear of making mistakes influences what many organizations do and don't do.« Not so at Dyemansion, which always makes doing what needs to be done and maintaining a clear, uncluttered vision its top priorities. »It's the only way we'll be able to stay agile and innovative and avoid sinking into the sea of mediocrity out there,« Witter says.

+ FURTHER INFORMATION:

- » fon-mag.com
- » dyemansion.com



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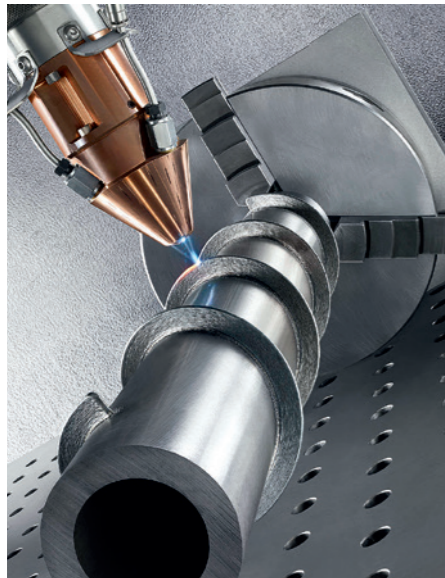
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TALKING ABOUT

»The key is mastering the process chain«

Additive manufacturing has by now become an important business sector for global corporations like Trumpf, and its strong growth trend shows no signs of diminishing. The laser manufacturer, with its head office in Ditzingen in southern Germany, wants to secure revenue of 500 million euros in the area of additive manufacturing alone in the next few years. In an interview with formnext magazine, Dr.-Ing. E.h. Peter Leibinger, Chief Technology Officer at Trumpf, speaks about the company's plans for the future and the current challenges facing the industry.



Mr. Leibinger, during your press event at formnext 2017, you described additive manufacturing (AM) as an ambivalent topic. Can you explain in two sentences what you mean by this?

LEIBINGER On one hand, the additive manufacturing sector is developing in the direction of series production, with customers from industries such as the dental and aerospace industries buying machines to produce their components. On the other hand, there is a great deal of hype around the topic and it is sometimes hard to tell what is hype and what is real.

Trumpf has been focusing on additive manufacturing technology for quite a while now ...

LEIBINGER Yes, we have been working on this technology since the mid-1990s and launched the first powder-bed-based machine on the market in 2003. We were pioneers in this area and the market was not quite ready. For this reason, we stopped selling this machine after

three years and switched our attention to laser deposition welding using nozzles. In hindsight, this was a mistake because the market for robust laser metal fusion (LMF) machines for industrial production has grown considerably in recent years.

Trumpf is one of the leading machine manufacturers on the market today. Can you tell me about current developments and the company's goals?

LEIBINGER Our AM systems are selling well: We put more than 100 machines on the market in 2017. Our attendance at formnext undoubtedly contributed to this. We want to secure a revenue of 500 million euros in the area of additive manufacturing in the next five to seven years. At the moment, we have more than 200 employees working in this area and we expect to add another 100 by the end of 2018. But we also know that we need to remain realistic and that success requires patience. »

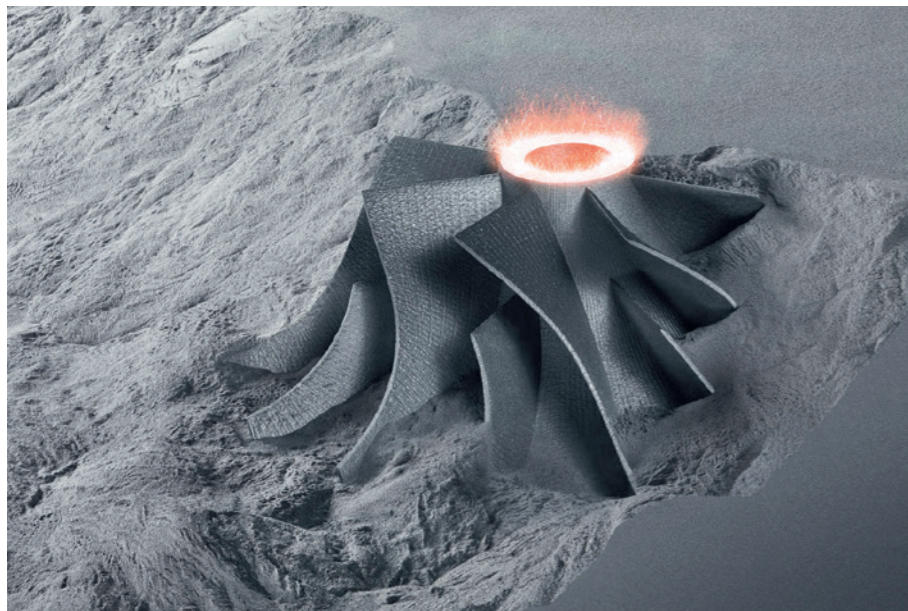
Trumpf has chosen to concentrate on two additive technologies: laser metal fusion (LMF) and laser metal deposition (LMD).

Text: Thomas Masuch

Photos: Trumpf



+ Dr.-Ing. E.h. Peter Leibinger, Chief Technology Officer at Trumpf.



TRUMPF GmbH + Co. KG
 Trumpf was founded in 1923 as a series of mechanical workshops, and has since developed into one of the world's leading companies for machine tools, laser technology, and electronics for industrial applications. With 12,000 employees, the company generated sales of 3,111 million Euros in the 2016/17 fiscal year.

We are laser manufacturers, and we are mechanical engineers. That's why we have a very detailed understanding of our customers' requirements.

Unlike most other companies in the world of additive manufacturing, Trumpf has a long tradition. Does this give you a competitive advantage?

LEIBINGER The key to successful industrial 3D printing, of metals in particular, is mastering the process chain. And this is where I see two advantages for Trumpf. First, we are laser manufacturers. And second, we are mechanical engineers. We have a very detailed understanding of our customers' requirements and how our customers work. Thanks to our strong position on the global mechanical engineering market, we also have a powerful international service network. Our customers expect nothing less from us.

Trumpf has chosen to concentrate on two additive technologies: laser metal fusion (LMF) and laser metal deposition (LMD). Why is that?

LEIBINGER LMF is particularly well suited to manufacturing geometrically complex parts, e.g. parts with internal channels and cavities. LMD offers higher productivity, but the quality of the components produced is slightly lower. It can also be used to produce larger hybrid components. Because we are experts in both technologies, we can cover a wide range of requirements and offer our customers the most suitable approach based on their needs.

What is the critical »know-how factor«: the powder, the machine, the process, or the integration?

LEIBINGER I think that the machine, in conjunction with system integration, is the most important factor.

What challenges do you see associated with the further development of additive manufacturing?

LEIBINGER There is still no ready-made solution on the market that can handle the additive manufacturing process from the CAD stage through to the finished component. The development process can be visualized as an onion. The inner layer, where we are now, contains the production hardware and powder management. The next layer will be system integration.

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

+ FURTHER INFORMATION:

- » fon-mag.com
- » trumpf.com



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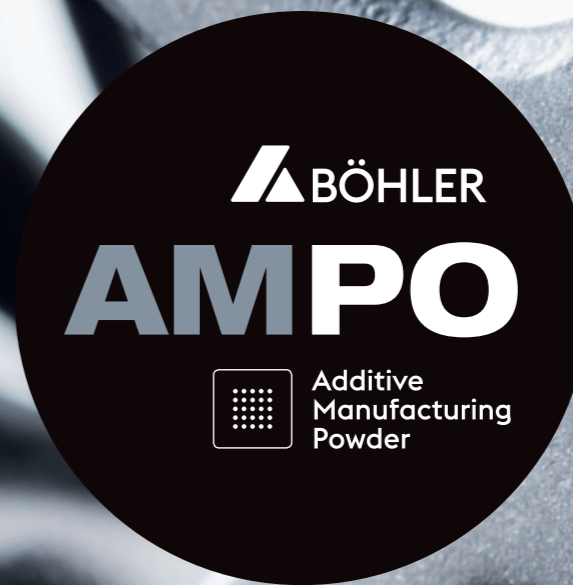
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NO CHOICE BUT TO GROW



Daan A.J. Kersten (left) and Jonas Wintermans form the duo at the helm of Additive Industries.

Additive Industries wants to become a top-three manufacturer of 3D metal-printing equipment.

Despite his company's young age, Daan A.J. Kersten wasn't shy about the big plans he has for Additive Industries at formnext 2017: »We're joining the race to the top!« He's looking to establish the five-year-old Dutch firm as one of the top three in its industry. According to Kersten, Additive Industries and its 50 employees currently rank around seventh in the world. While his plans for growth are being driven by what he sees as the ongoing dynamic expansion of the surrounding market and industry, he reports that the arrival of huge corporations like GE and DMG is leading to consolidation, as well. »And that certainly won't be the end of it,« he predicts.

For Kersten, the involvement of these heavyweights has ramifications for the remaining manufacturers of industrial AM equipment.

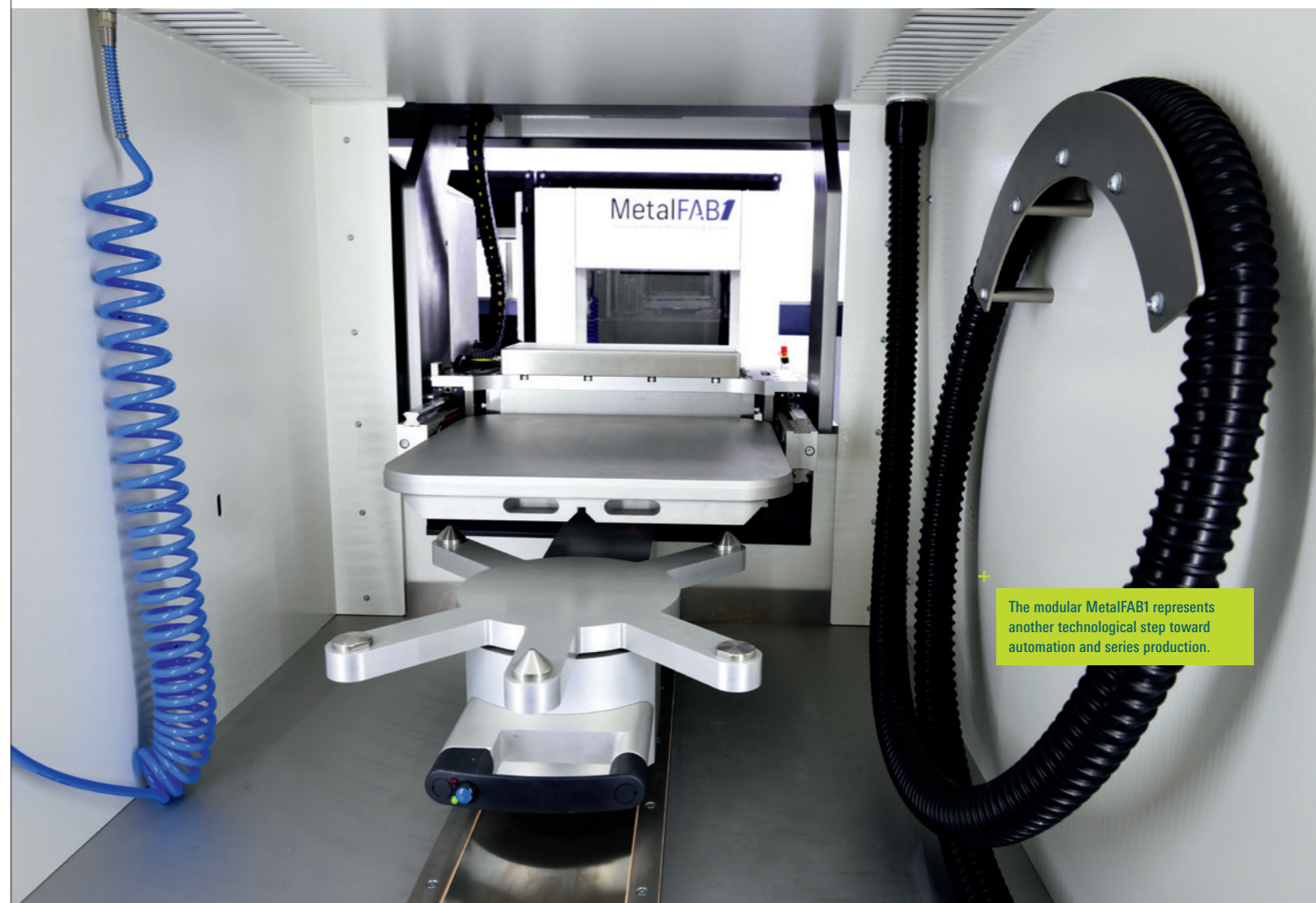
»It's getting harder and harder for other players to survive in the market. Companies that stay relatively small will find it very difficult to continue on without partners,« he reveals.

Kersten thus believes that Additive Industries has only one option in responding to the developments taking place on the market. »We need to get bigger, and fast. Growth is the right thing to do in this market now,« he declares, adding that this is the only way to »be the masters of our own destiny«. On a side note, this echoes the belief that led Frank Herzog (the founder of Concept Laser) to agree to a partnership with GE (we have reported in our edition 01 2018).

NEW FACTORY IN EINDHOVEN

Meanwhile, Kersten is backing up his planned growth targets with real action: In April »

Text: Thomas Masuch



The modular MetalFAB1 represents another technological step toward automation and series production.

Offering fantastic systems and attractive software is all well and good, but ultimately, the whole thing just has to work.

Photos: Additive Industries



In moving to a new factory in Eindhoven, Additive Industries is underscoring its plans for growth.

2018 Additive Industries moved into a new factory in Eindhoven. »It's going to give us plenty of room to grow,« he affirms. The company is also planning to double its workforce as it assembles and ships out 20–25 industrial units in 2018. The first thing you need to achieve this type of growth is, of course, money. When asked how Additive Industries is financing its plans for the future, Kersten points to one of the company's biggest partners – a major family-run firm in the Netherlands that has made its investment part of its long-term plans.

Additive Industries' expansion strategy is taking shape outside of Europe, as well. Besides the new outpost it is planning to establish in Singapore, the company opened its new Process & Application Development Center in Los Angeles in December 2017. With its 500 square meters offering space for 20 employees, the center's proximity to the American aerospace industry in southern California should enable Additive Industries to share in this sector's own strong growth. Kersten believes this move is full of potential, citing that »aerospace is where we're seeing the most advanced AM applications«.

FOCUSING ON PRODUCTION

In Kersten's view, his company's pinpoint focus on what is essentially one product – the MetalFAB1 – is another fundamental aspect of how it will continue to succeed in its hotly contested market. In fact, this was already the plan back when the card-carrying mechanical engineer founded Additive Industries five years ago. Numerous players and machines were already on the market back then, but »they

were all fixated on prototyping«, as Kersten puts it. »Our company, on the other hand, saw a lot of market potential in 3D printing finished components and designed a machine for that purpose.«

According to Kersten, 10 or 15 of these machines have been installed since Additive Industries delivered its first MetalFAB1 in 2016. Some of them are currently being used by beta customers that were offered discounts to help Additive Industries gather experience in specific applications. Here, the company has even convinced some well-known corporations to participate in this program based on one key factor in particular: »We're really open to all kinds of innovations,« Kersten says.

PARTNERS OF CONSIDERABLE RENOWN

Additive Industries can indeed count on the backing of prominent and powerful associates: Airbus is putting a MetalFAB1 to use, and Additive Industries has also been a partner of Sauber Motorsport since the Swiss F1 team commissioned its own unit in October 2017. Meanwhile, the technology group GKN – one of the world's largest producers of metal sintering powder – is already preparing to make the leap to series production (see our edition 01 2018).

Series production is also the ultimate aim of Additive Industries' cooperation with the SMS group, which employs some 14,000 people around the world. Based in Düsseldorf, Germany, SMS wants to start using AM techniques to construct and sell entire turnkey plants featuring powder atomizers, CNC machines for postprocessing and quality assurance – and of course, MetalFAB1 units.

CLOSER AND CLOSER TO AUTOMATION

A technical innovation Additive Industries showcased at formnext 2017 represents the next step toward series production and automation. Product Removal, its latest component for the modular, extensible MetalFAB1, features a bandsaw and a three-axis milling machine. The device removes excess powder from printed objects, separates them from the build plate, and mills the plate back down to its original state. While his company is still working on achieving 100% automation with the module, Kersten can already guarantee a high degree of reliability. »Offering fantastic systems and attractive software is all well and good, but ultimately, the whole thing just has to work,« he points out.

At formnext 2017, Additive Industries also demonstrated a new software solution designed to promote greater productivity within the build envelope. »The trend is toward incorporating more and more lasers, but their ability to function is also important,« asserts CTO Mark Vaes. The challenge, Vaes says, lies in controlling the lasers in a way that keeps them free of smoke, which is why the new software works with different parameters. Eventually, this innovation should enable the MetalFAB1 to reach production volumes of around 1,000 dm³ per year.

+ FURTHER INFORMATION:

- » fon-mag.com
- » additiveindustries.com

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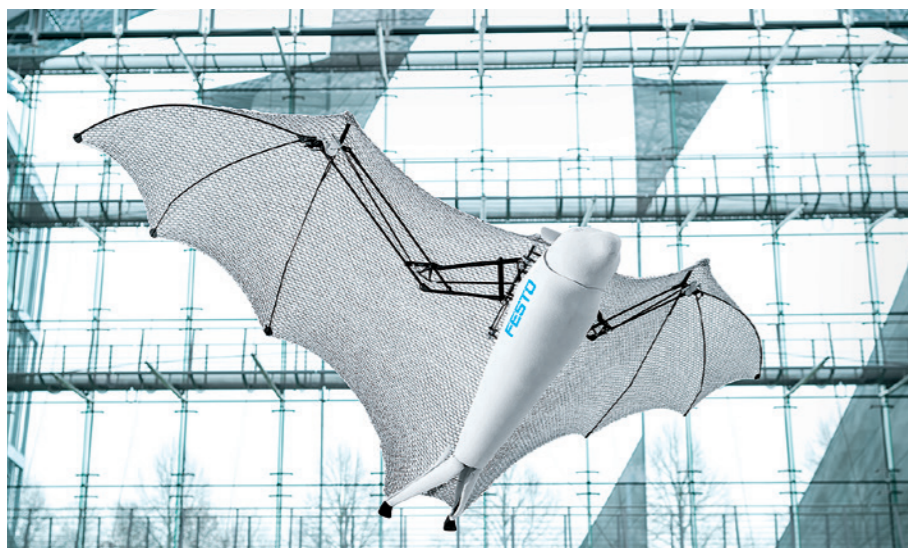
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TRENDS



SEMI-AUTONOMOUS FLYING FOX

By designing the BionicFlyingFox, Festo, a company specialized on automation technology, has transferred the principles of nature to an ultra-lightweight flying object. With a wingspan of 228 cm and a body length of 87 cm, the artificial flying fox weighs just 580 gms.

For the BionicFlyingFox, Festo's developers from the Bionic Learning Network had a close look at the flying fox and technically implemented its special flying characteristics. The

BionicFlyingFox is able to move semi-autonomously in a defined space, it communicates with a motion-tracking system. The installation constantly records its position. At the same time, the system plans the flight paths and delivers the necessary control commands for this. A person performs the start and landing manually.

The flying fox belongs to the order Chiroptera – the only mammals that can actively fly.



A particular characteristic is their fine elastic flying membrane that stretches from the extended metacarpal and finger bones down to the foot joints. The bionic model's flying membrane is wafer-thin, ultralight whilst also robust. It consists of two airtight films and a knitted elastane fabric, which are welded together at approximately 45,000 points.

FROM PLASTIC WASTE TO PUBLIC BENCHES



There's a serious flaw in the way plastic packaging is designed, points out architect and designer Panos Sakkas. »It's made to last forever, but thrown away shortly after it's used.« This was what led Sakkas and Foteini Setaki to launch the project »Print Your City!«, which transforms recycled synthetics into public benches and other useful objects with the help of 3D printing.

The project's first prototype is the »XXX bench«, which is a meter and a half long and weighs 50 kilograms. It was produced by the company Aectual, which has a large, robot-based extrusion 3D printer at its headquarters on the north side of Amsterdam.

Print Your City! is centered on the idea of turning recycled plastic waste into synthetic pellets. »This comes with some challenges,« Sakkas concedes. »The material can be contaminated

by dirt and unwanted synthetics, it can break down under certain weather conditions, and it can contain unknown additives that give off toxic fumes when melted down.«

The »XXX bench« was tested in downtown Amsterdam at the Museumplein (a square that features the »Rijksmuseum«, the »Stedelijk Museum«, and the »Van Gogh Museum«) and in front of the »Stadhuis«. The city has since begun talking with investors about making more of them and placing them in various locations. In the future, the designers want to incorporate recycled plastic into further uses that benefit the public, including bus stops, playground equipment, and containers for other recyclable materials.

Photos: Festo (on top), Print Your City! (below)

TRENDS

»LA BANDITA« PAVES THE WAY FOR A NEW PRODUCTION

Accelerated by Siemens, the California Hackrod company wants to pave new and groundbreaking ways of the vehicle production: designed in virtual reality, engineered with AI and 3D printed. This could result in significant progress combining Additive Manufacturing and mass customization within the automotive industry.

The first prototype, a speedster named »La Bandita« speedster is based on sports car chassis 3D printed in aluminium alloy. It was designed in Hackrod's factory of the future, which uses multiple tools from Siemens PLM

Software. Dr. Slade Gardner, Hackrod CTO emphasizes how important the cooperation with the German Siemens Group is. »Our shared vision includes optimized aesthetic design, robust validated engineering, complex advanced manufacturing and rapid in-situ quality assessment.«



MORE THAN JUST A BIKE

What began as a dream for the Slovakian designers at »Paul+Murin Creative« e later became reality with the help of 3D printing: an Enduro bike (or e-bike) that they could design regardless of production or bike manufacturer specifications.

For more than 25 years, »Paul+Murin Creative« has been designing bikes, mainly for the Slovakian manufacturer Kellys Bikes. A few years ago, the idea of designing a very special bike emerged. As the designers then heard about the possibilities of 3D metal printing, the design took a step in this direction.

»We didn't want our ideas to remain as just drawings or digital models. We also wanted to manufacture the e-bike,« explains Jiří Maňák from »Paul+Murin Creative«, speaking to formnext magazine. Additive manufacturing was the only way to do this, as it allowed an individually optimized bike to be manufactured without large investments in conventional production planning.

During the three-year development phase, the challenges faced in development included integrating the battery into the frame and the very small work areas of the metal printers.



As a result, the first frame had to be welded together from eleven printed parts. The finished 3D printed e-bike was named Kinazo ENDURO e1.

What proved to be extremely beneficial was that Volkswagen Slovakia in Stupava, near Bratislava, purchased a Concept Laser X LINE 2000R for its tool production, which is one of the world's largest 3D metal printing systems.

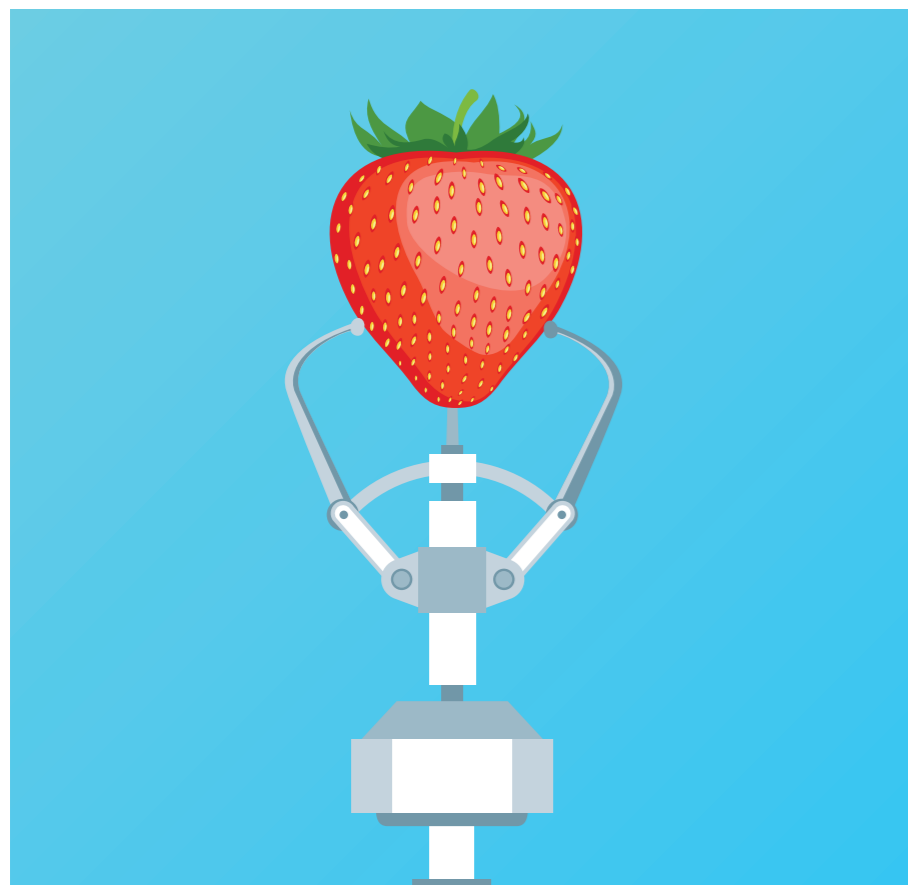
The 4-kilogram frame currently generates production costs of around € 20,000 for the e-bike. »Admittedly, the bike is not cheap, but it's something very unique – more than just a bike,« says Jiří Maňák. The e-bike is currently for »real technology enthusiasts« who can afford to buy such a rarity. However, Maňák expects production costs to fall in the future.

» Further information: fon-mag.com



Photos: Hackrod (on top), Paul+Murrin Creative (below)

»OUTSIDE THE BOX«



Automated Strawberry Fields Forever

Whether it's self-driving cars, automatic lawnmowers, or Alexa, robots of one kind or another have already begun taking over parts of our lives. These areas are sure to expand in the future, and the end – in every sense of the word – is difficult to perceive way down the road. Just recently, the European Parliament argued for legal measures that would grant »electronic personhood« to robots. It also wasn't long ago that technology pioneer Elon Musk warned of the existential threat that artificial intelligence could one day pose to human society.

In the face of such uncertainty, the project the Belgian company Octinion is currently working on definitely comes as a relief: Instead of a technological evolution on the order of »R2-D2« or »NS-5« (from the movie »I, Robot«), its employees have developed a robot that picks strawberries using a 3D printed arm.

This may sound relatively mundane, but it could definitely mean something to the

strawberry industry. With its endless rows of greenhouses, Belgium (along with the neighboring Netherlands) is one of the world's most efficient producers of the fruit. No other place harvests as many strawberries per square meter.

Left to ripen under plastic tarps, strawberries from the Netherlands have grown tastier than the »water balloons« the country was once infamous for, but even today, the casual gourmets out there don't expect a rush of flavor from Dutch fruit. On the other hand, you do have to hand it to the country for making such an important contribution to the cultural and historical development of the modern strawberry. Since the Stone Age, the common folk of Europe had been familiar with the tangy, but puny wild strawberry, which they cultivated on large fields in the Middle Ages. Then the Chilean strawberry was crossed with North America's Virginian strawberry to produce the plump variants we know today, and the Netherlands was where the first of them were grown.

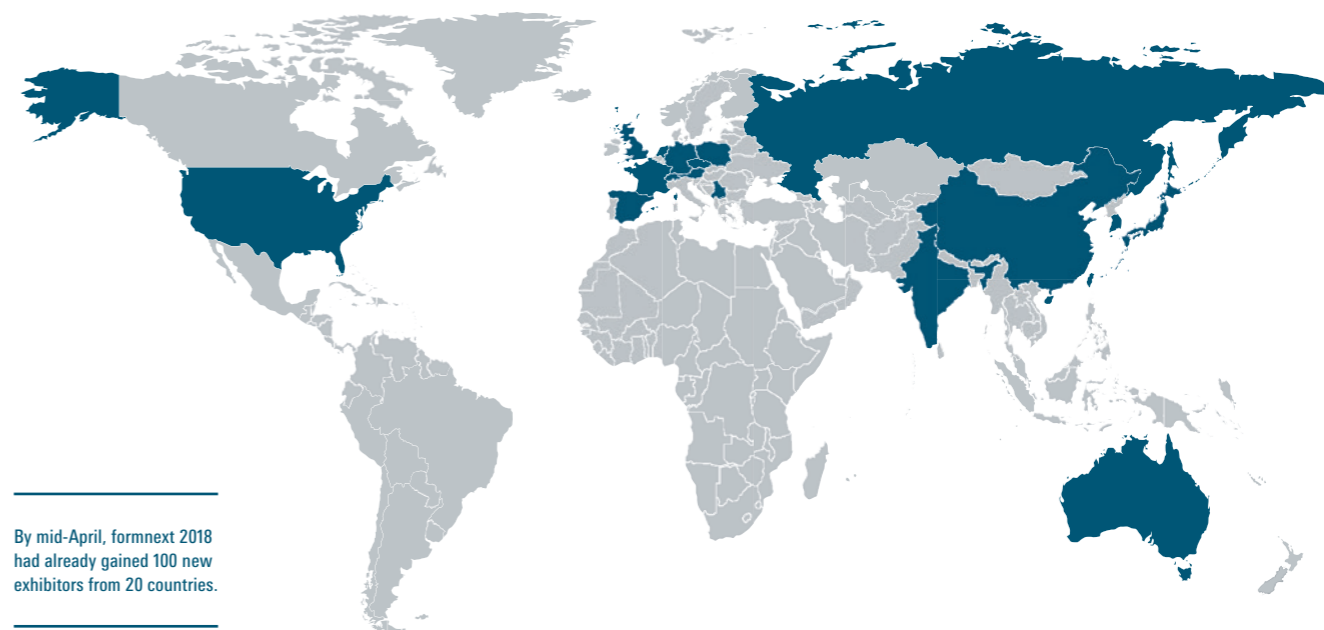
These days, however, the country's strawberry industry is groaning under the weight of high labor costs and a lack of skilled workers (pickers, that is). Fruit-picking robots could thus aid the Benelux countries in defending their status as the traditional home of greenhouse strawberries against industry giants like China, Mexico, and the United States. One added benefit would be not having to worry about claims for damages: If a robot starts applying too much force while picking, whipping up some nice strawberry jam will still be an option!

Text: Thomas Masuch

Illustration: iStock/lexa7575, iStock/sorbetto

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