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Messe Frankfurt Group

Sameness leaves us in peace, but it is contradiction that makes us productive.

Johann Wolfgang von Goethe (1749–1832),
German writer and philosopher

Cover: Lithoz

For many people, seeing the proverbial glass as half-empty or half-full is a matter of personal philosophy. Given how spoiled we've been with growth in the AM world, that glass has mostly been all the way full in recent years. These days, however, sections of our industry have come back down to earth to a certain extent. Those who mainly operate in the automotive or mechanical engineering sectors are likely going through a more difficult period than companies in medicine, aerospace, or defense.

The amount of water in the glass also depends on the country in which you do business. Here in Germany, the economy is more or less stagnating at the moment, while other European countries and the United States continue to exhibit healthy growth.

There is indeed a good deal of variance in how the AM industry is developing. Consider the following, for example: The overall AM market is still growing, but the share prices of many major AM companies have fallen off a cliff. One thing that is becoming increasingly clear, though, is that AM stands at a crossroads. Once they reach industrial maturity, many applications face the tough question of how cost-effective they are in certain customer segments and batch sizes, often in comparison with conventional methods. That turns up the pressure, but it also gives AM another push toward the day when it will be considered »just another« manufacturing technology without all the hype.

The subject of Additive Manufacturing as it relates to sustainability can also be approached from a number of different angles. AM can make a marked difference in this regard, but the technology itself is not inherently more sustainable than others; it depends on how and where you use it. To learn more about how complex such considerations can be, check out the article on page 15.

The ambivalence of the current economic climate is also reflected by our exhibitors and other partners. This teaches us that the world of Additive Manufacturing isn't just capable of changing many things; AM itself is always changing, too.

If you want to succeed in going with the flow, you need both a strong compass and a certain degree of flexibility. These are two characteristics we've combined at Formnext, which does its best to be AM's guiding light each and every year. It's the place where the biggest trends shine, along with new and highly innovative firms that continue to shake up our industry. With an extensive supporting program of conferences, seminars, and special topics – and this magazine, of course! – we offer valuable knowledge to you and everyone else in our industry who likes to keep their glass as full as possible.

Sincerely, Sascha F. Wenzler
Vice President Formnext

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FORMNEXT STEPS ON THE GAS WITH AN EXPANDED FRINGE PROGRAM

Formnext is continuing its impressive success story in 2024. Despite a rather sober economic situation in Germany and the political challenges the world faces, around 715 companies (63% of them from abroad) had registered for the world's leading trade fair for Additive Manufacturing and the next generation of industrial production by the beginning of August.

MULTISTAGE CONFERENCE CONCEPT TO BE CONTINUED

After the successful premiere of its new multistage concept last year, Formnext will continue its conference program in 2024, with current and future appli-cations, technologies, and overarching trends in the AM and manufacturing industry to be discussed once again on three stages. The key topics on the Application, Industry, and Technology Stages will include artificial intelligence in Additive Manufacturing, medical and dental technology, and robotics and automation.

PARTNER COUNTRY: AUSTRALIA

This year's Formnext partner country is Australia. This versatile continent has been impressing for years with its strong AM community, globally successful equipment manufacturers and service providers, and highly specialized AM companies. At the foundation of it all are outstanding universities and, last but not least, a unique environment that attracts talent from all over the world to Down Under (for more, turn to page 18).

HUB FOR ADDITIVE MANUFACTURING AND DIVERSE FRINGE PROGRAM

With its diverse fringe program and year-round activities, Formnext is now much more than just a trade fair: Formnext Magazine, Formnext.TV, the AM Field Guide, the successful Discover3Dprinting seminars, and much more provide both newcomers and experts in the additive world with insights, analysis, and inspiration. Formnext is thus primed to reach a broad audience from numerous branches of industry and establish itself as an international hub for all aspects of Additive Manufacturing.

The fringe program of Formnext 2024 features both established events and several completely new items. For example, the former award concept for start-ups has been developed into the new Formnext Awards in order to put young talents and their ideas even more in the spotlight. The awards will honor young, innovative companies, sustainable business ideas, groundbreaking technologies, and much more across six different categories. Applications for this year can still be submitted until 6 September.

Meanwhile, the Service Provider Marketplace will focus on medical and dental technology in 2024 following its successful debut last year. At Career Day, job seekers can find out about career opportunities in the AM industry. For companies looking to enter the AM industry, excellent insights and advice will be on offer in the daily Discover3Dprinting seminars, which are to be held in cooperation with ACAM.

Finally, the VDMA will be presenting a special show with valuable AM applications from the world of mechanical engineering. The BE-AM special showcase will use real-world scenarios to demonstrate advanced developments in the increasingly important topic of 3D Printing in the construction industry. At the same time, the BE-AM conference will present numerous backgrounds and future developments in this field.

Graphic: feedbackmedia.de

+ FURTHER INFORMATION:

» formnext.com/expo
» formnext.com/awards

More information on the supporting program of Formnext 2024 will be available at
» formnext.com/Event_calendar

SURFACE FINISHING AT THE REFACTORY

Image: AM Solutions

The 3D Printing workshop at the Refactory in Flins (near Paris) prints prototype parts, manufacturing support tools, and mass-produced vehicle parts to meet the needs of the Renault Group and external companies. The French carmaker has poured its more than 20 years of experience in Additive Manufacturing into the location. The center now has 18 polymer 3D printers spread out over 500 square meters, along with a dedicated post-processing area that includes an AM Solutions surface-finishing machine and a coloring machine.

When Renault embarked on its AM journey some 20 years ago, it began with wire deposition processes to design tooling. The group has since continued to develop AM at various production sites. In 2020, the Refactory project was initiated in Flins with a focus on four main areas, which Renault has dubbed Re-trofit, RE-energy, Re-cycle, and Re-start. »Industrial 3D Printing needs to be reliable, repeatable, and efficient in terms of cost, quality, and lead time,« says Mélanie Chevé, Additive Manufacturing process manager at Renault Flins. In the past, many post-processing operations still had to be carried out manually on Renault parts. Apart from being time-consuming and labor-intensive, this produced inconsistent results. To optimize these operations, Renault Flins procured an S1 post-processing machine from AM Solutions, which is designed to reduce blasting and cleaning times and improve the durability and appearance of dyed parts. The challenge therefore lay in automatically cleaning MJF PA 12 printed parts and then finishing them with color. The S1 is capable of performing cleaning and surface finishing with just one processing medium in one self-contained unit. It can also automatically remove residual powder after printing. The constant rotation of work pieces during the cleaning process ensures consistent and repeatable blasting results. »The ability to use the S1 for different blasting programs with different recipes and different media was what gave rise to our post-processing project,« says Nicolas Blondel, head of the 3D Printing team in Flins.

+ FURTHER INFORMATION:

» solutions-for-am.com

MORE THAN 60 PERCENT FASTER

With various recently introduced machines, the AM industry is confirming the trend towards specialized applications, significantly improved efficiency, and ultimately, lower production costs. Stratasys and Roboze, for example, are promising greater efficiency and increases of more than 60 percent in printing speed with their new printers. The examples below also show that the medical technology and dental sector continues to drive the development of the AM industry (for more, please turn to page 8).

MORE EFFICIENCY FOR ORTHOPEDIC IMPLANTS

The new Spectra M electron beam fusion printer (EB-PBF) is Colibrium Additive's answer to the demand for EB-PBF printers with smaller build volumes. With a volume of 270 × 430 mm and a beam power of 4.5 KW, the Spectra M is aimed in particular at manufacturers of medical and orthopedic implants who, according to Colibrium Additive, want to further reduce the cost per part. »Spectra M is our direct response to our constant dialog with customers, particularly additive super users in the orthopedic implant industry,« says Oscar Angervall, senior product manager at Colibrium Additive.

The Spectra M is equipped with EBMControl 6.4 and compatible with Point Melt, Powder Supports, and Plate Free technology, as well as with the materials Ti6Al4V Grade 5 and Ti6Al4V Grade 23. The Spectra M is available to order now, with first deliveries expected in early Q1 2025.

ALIGNERS, CROWNS, AND BRIDGES AT EVEN HIGHER SPEEDS

The Stratasys DentaJet XL is designed to further improve dental lab productivity and reduce costs with its larger resin cartridges, large print tray, super-high-speed mode, and minimal post-processing workflow. With this printer, Stratasys is targeting digital dental labs that need to deliver high volumes of orders without compromising on quality. »It's the most efficient solution we've developed to date for producing high-precision crowns and bridges, implant and aligner models, and surgical guides simultaneously on a large scale,« raves Ronen Lebi, vice president of Stratasys Dental. The DentaJet XL can print two materials simultaneously, and by introducing new print modes and larger cartridges, Stratasys promises to reduce the cost per part by up to 67 percent. »The new super-high-speed mode has allowed us to increase our production of clear aligners by almost 50%, without additional labor and at a significantly lower cost per part,« says Prof. Armando Razionale from Airnivol, which was one of the first customers to use the solution in Europe.

BETTER MATERIAL FLOW FOR »SUPERPOLYMERS«

With the Argo 500 Hyperspeed, Roboze has introduced a new printer for »superpolymers and composite materials« that features new and patented technologies. In particular, Roboze cites the PolyFlow X system, which enables an extremely fast and controlled material flow that can reduce production times by up to 62 percent.Another feature is the Smart Gcode printing mode. In this mode, the system can process a variety of special plastics, such as PEEK, Carbon PEEK, ULTEM AM9085F, Carbon PA PRO, and PEKK, which Roboze claims are »as robust and durable as metal«.

+ FURTHER INFORMATION:

» colibriumadditive.com

» stratasys.com

» roboze.com

Images: Colibrium Additive, Stratasys, Roboze

HEALTHY GROWTH

Applications in medicine and dentistry are a constant driver of growth in Additive Manufacturing. Join us for an overview of the development of specific sectors and the market at large.

Text: Thomas Masuch

Images: Lithoz

The fact that medicine was one of the first fields in which Additive Manufacturing was used was no coincidence. It's an area where AM can all of its strengths to bear: Whether it's implants, crowns, or surgical guides, the products in question are often complex and tailored to the individual patient. It's also no wonder that medicine not only remains one of the key markets in AM today, but looks poised for healthy growth going forward, as well. Every year, the technology takes hold in further areas of application, and more and more hospitals are establishing their own AM departments.

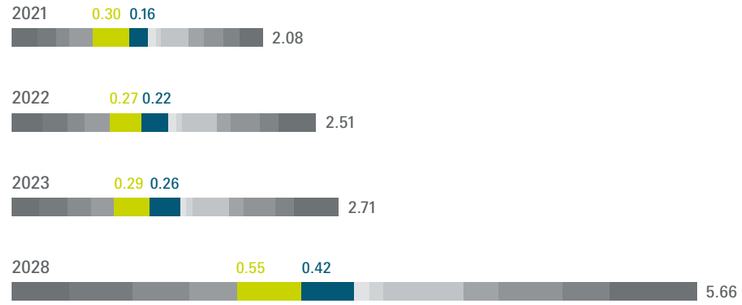
One of the global leaders in 3D Printing of this kind is surely the Mayo Clinic (Minnesota, USA). In Germany, meanwhile, Münster University Hospital has built its own impressive 3D center and amassed a great deal of related expertise over the past two years (to find out more, please turn to the report on page 12).

HEALTHY MARKET GROWTH

According to the most recent Wohlers Report, medical and dental applications accounted for US$2.75 billion last year, which represents 13.7% of the overall AM market. Terry Wohlers (head of advisory services and market intelligence at Wohlers Associates) expects such applications to continue evolving on various fronts in the coming years – particularly in connection with clear polymer aligners, polymer models for dental treatment planning, and crowns and bridges.

The market share of equipment used solely for production purposes is even larger: The Ampower Report has assessed it at 20.3%, which corresponds to an overall volume of €500 million.[1] That's

[1] The 2024 Ampower Report estimates the volume of the current overall market for production equipment in metals and synthetics at €2.71 billion.



Global revenue in metal and polymer AM equipment, by industry from 2021 to 2023 and forecast for 2028 (Billion EUR)

nearly twice as much as the next most prominent sector in industrial applications. Even when considered separately, medicine (10.7%) and dentistry (9.6%) perform admirably. For the years ahead, the market researchers at Ampower are projecting a constant increase in machine sales, which could reach €970 million in total by 2028. »After one or two down years when the COVID-19 pandemic suppressed demand and there was uncertainty regarding the approval of new products, the market is back on an upward trajectory,« reports Ampower CEO Maximilian Munsch. »We're also predicting that the pioneers in the medical field will gradually replace their old machines.«

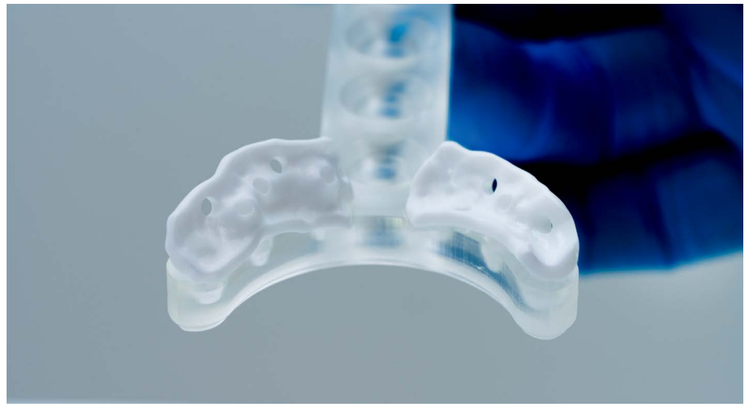
Meanwhile, the company's analysis indicates that the dental sector will grow somewhat more slowly than the rest of the market. Ampower's projections put the dental market's share of total sales in AM machines at 7.4% (€420 million) in 2028. »Dental is an established market, so it's already reached a certain amount of saturation,« Munsch explains. »In metal printing, low-cost systems are available that generate less revenue.«

NEW MATERIALS AND APPLICATIONS IN MEDICAL IMPLANTS

Outside of dentistry, implants represent some of the most important additive applications in medicine, as well. Metal 3D printers are churning out hip and shoulder joints by the thousands, along with corresponding surgical instruments. These implants offer several advantages over their conventional counterparts: 3D printed joints can be customized to each individual patient, for example, and their porous surfaces promote faster and more stable bone ingrowth.

This is another area where 3D Printing continues to gain users in further areas of application. In fact, the US company ZSFab just recently announced the first clinical use of a 3D printed titanium implant in a patient's lumbar spine. Dubbed the InterConnect 3D printed TI Lumbar Interbody System, the implant has featured in three spinal operations at Tulsa Spine & Specialty Hospital in Oklahoma. The combination of a special surface and a stochastic lattice structure was also used in order to enhance the osseointegration process.

The field of material research has also been making major progress of late, which is why implants no longer need to be made of metal alone. 3D Systems, for example, unveiled 3D printed cranial implants made of plastic at Formnext 2023. Since then, the US firm has reported that its 3D printed PEEK implants have been used successfully in nearly 40 cranioplasties all across Europe in recent months, including at University Hospital Basel (Switzerland), University Hospital Salzburg (Austria), and the Tel Aviv Sourasky Medical Center (Israel). »



3D printed ceramics are seeing more and more frequent use

MORE STANDARDS AND TAILORED TREATMENTS IN THE FUTURE

Terry Wohlers is also predicting a significant increase in orthopedic implants in the coming years, especially with regard to standard components for spinal and hip prostheses. »Patient-specific treatments will become more common as well, but are likely to remain the exception rather than the rule,« he states. In addition, Wohlers projects a rise in the use of AM for individual incisions in full knee replacements and in custom-3D printed implants for cranial and jaw reconstructions.

DOCUMENTING THE ADVANTAGES OF PREOPERATIVE PLANNING

Physicians at more and more hospitals are using 3D printed models to prepare for surgeries. Among other benefits, such efforts are meant to reduce the duration of operations and help patients understand their impending procedures. A clinical study by Stratasys and Ricoh USA is now attempting to determine how significant the advantages of these models actually are. In the process, it is examining the use of individual 3D printed models for preoperative planning and tumor removal in orthopedic oncology and comparing it against the current standard method, which is based solely on CT or MRI scans.

The study aims to identify potential improvements in surgical outcomes, such as reduced blood loss, shorter operations, and lower risk of complications. In an experimental group, tumors are being removed with the help of 3D printed models, while a control group is working with the aforementioned imaging techniques.

RECOGNIZING PROSTHESES AND ORTHOSES AS A BUSINESS OPPORTUNITY

Orthopedics is another field where Additive Manufacturing is playing an increasingly prominent role (for a more detailed analysis, check out the 02/2024 issue of FON). The common applications include customized orthoses for hands and forearms. According to Wohlers, however, predicting the further development of this area is no easy feat. »Like other medical applications, it will require professionals to see it as an opportunity to build new streams of business.«

Those who have already recognized a new business opportunity in this sector include Create it REAL (Denmark) and Ortóiberica (Spain), which specializes in orthopedics. The two companies are planning to enter into a strategic partnership in order to bring 3D Printing technologies for seating aids and corrective corsets to market. Ortóiberica will be responsible for Spain, Portugal, and Morocco. Create it REAL, meanwhile – which previously specialized primarily in insoles, as we reported in our 03/2023 issue – is also looking to expand its reach in the orthopedic sector and contributing its fully digital CAD-CAM solution for that purpose. Toward the end of this summer, Ortóiberica is set to start producing 3D printed corsets, seats, and cushions at its facilities in Asturias, Spain.

DENTAL ALIGNERS DRIVING GROWTH

In the dental market, 3D printed crowns, bridges, and implants have been widely used for some time, even replacing previous manufacturing methods in some cases. Further progress has also been made in other areas, including in the use of new materials like ceramics. At Kepler University Hospital in Linz (Austria), for example, a ceramic implant 3D printed by Lithoz was recently inserted under the periosteum of a patient's jaw. According to Lithoz, this novel approach is designed to eliminate the need for bone augmentation and reduce the time required for healing by an estimated 75 percent. The implant in question, which was made of biocompatible zirconia, proved to be clinically stable 60 days after the operation, which meant the adjustment of the patient's dental prosthesis could begin.

Elsewhere in the dental sector, aligners have been turning in tremendous growth in the past several years, and market analysts believe that trend is set to continue. In just one example, 3D Systems recently announced a multi-year deal worth around a quarter of a billion dollars that involves the indirect manufacture of aligners. The company claims that its 3D Printing systems can produce up to a million aligners in a single day.

Another landmark development in the aligner market was surely the €79 million acquisition of the Austrian start-up Cubicure by Align Technology, a medical equipment firm based in Las Vegas (USA). Cubicure has developed patented hot lithography technology that makes it possible to process highly viscous resins and thereby produce extremely durable, temperature-resistant polymers.

Images: MPI-INF, Lithoz

Meanwhile, Fidentis – a spin-off of Fraunhofer IGCV – is seeking to improve many people's lives with 3D printed removable dentures.

Fidentis is working with an M 290-1 1kW 3D Printing system that was customized by AMCM to include an integrated robotic arm, which makes multi-material applications possible.

A LONG ROAD TO WIDESPREAD USE IN MANUFACTURING PILLS

The 3D Printing of pills actually isn't anything new; the FDA granted corresponding approval for the first time back in 2015, to the epilepsy drug Spritam. Since then, however, this field has advanced much more slowly than most experts predicted. AM has not succeeded in truly breaking through in competition with the established and endlessly proven practice of pressing active and auxiliary ingredients into pill form. One reason why surely has to do with the complicated approval processes in this highly regulated market. Just recently, however, some momentum has found its way back into this area, with major corporations like Merck intensifying their efforts to 3D-print medicine. »3D Printing makes us much more flexible in the early stages of medicinal development and enables us to individually control the form, size, dosage, active ingredient release, and other characteristics of a pill simply by making a few changes in a digital file,« explains Thomas Kipping, head of drug carriers at Merck.

The Exentis Group also wants to make the 3D Printing of pills a more established part of its operations. The Swiss organization – which was founded in 2017 and now employs 130 people – has thus developed a platform that combines screen and 3D Printing. »With our proprietary 3D technology platform, we can manufacture pills with individual designs and active ingredient combinations in quantities of more than 200 million per year – all in the same production system,« reveals CEO Gereon Heinemann. The key advantage over conventional pills lies in the ability to specify how active ingredients should be released in the body over a period of up to 12 hours. This is achieved by printing these ingredients in different shapes. The effect such designs have on active ingredient release was the subject of research conducted by a group of experts from the Max Planck Institute for Informatics (Saarbrücken, Germany) and the University of California-Davis (USA) in 2023.

FUTURE POTENTIAL IN SKIN AND ORGANS

3D Printing can indeed be helpful when researching and developing new medical possibilities – and that applies to applications involving the tiniest components, as well. Take Boston Micro Fabrication (BMF), for instance, which has founded the subsidiary BMF Biotechnology, Inc. to work on the development of high-precision, microfluidic 3D biochips for pharmaceutical and cosmetic research. These »organ-on-a-chip« platforms make it possible to reproduce physiologically relevant tissue on a large scale, which is meant to improve the testing of cosmetics and medicines. BMF's biochips feature an integrated »vascular« network of channels that facilitate a near-in-vivo exchange of nutrients and waste, as well as the delivery of substances throughout the tissue in question. This design enables them to produce more precise test results than conventional 2D cell cultures and animal models.

Generally speaking, the 3D Printing of cells to produce living tissue is still in development and far behind the other applications, as Terry Wohlers explains. »Most of the work to date has been research and development in the TRL 1-4 range, with few exceptions,« he reports. »This field will be significant one day, but it will be quite a few years down the road.«

Opposite page:
Two subperiosteal implants made of zirconia on a jawbone model
Below:
With 3D printed medicines, it's possible to customize how active ingredients are released

For more exciting insights regarding the use of AM in medical technology and healthcare, be sure to check out the Application Stage at Formnext from noon to 1:20 pm on 19 November 2024.

+ FURTHER INFORMATION:
» formnext.com/fonmag

BETWEEN CERTIFICATION AND THE OPERATING TABLE

At University Hospital Münster, 3D Printing is supporting both patient care and research

Text: Thomas Masuch

Before you start applying 3D Printing to the field of medicine, you should definitely know the rules inside and out – which is something Dr. Martin Schulze has been spending a lot of time on in recent years. The engineer and orthopedist heads the 3D-Center at University Hospital Münster (UKM). With the help of a team that includes printing experts, radiologists, microbiologists, and other engineers, Dr. Schulze not only oversees the 3D Printing of incision templates and models for preoperative planning; he also deals with the frameworks that are meant to ensure UKM's compliance with the relevant regulations.

For an example of how complicated that can be in a sector as highly regulated as medicine, look no further than the relatively simple process of 3D Printing an anatomical model. Here, it makes a big difference whether the model will »only« be used for demonstration or to explain a procedure to a patient, or for planning an upcoming operation. It might even need to be a sterile object that will be used for tactile navigation purposes in the operating theater.

The 3D-Center at UKM claims to be the first clinic in the world to have had its printing process certified in line with the stringent requirements of the ISO/ASTM 52920 standard. This in turn opens the door to the overarching ISO/ASTM 13485 standard, which enables hospitals to manufacture and administer medical products directly at the point of care. »That sets us apart from other clinics of our kind,« Dr. Schulze explains. »One of the things that made this possible was the fact that the 3D-Center was planned based on a new concept and is now part of a network that includes all of UKM's other departments.« He views the center's certification and the way in which its quality management efforts have been organized as the foundation of all its research. »If I want to find out what kind of benefits can be achieved with 3D Printing as an on-site resource, the main thing I need to ensure is safety.«

In Münster, medical products classified in risk categories 1 and 2 are currently manufactured and used; they include things like organ models for preoperative planning and templates for surgical incisions. Moving up to risk category 3 – implants – is one of Dr. Schulze's definite plans for the future.

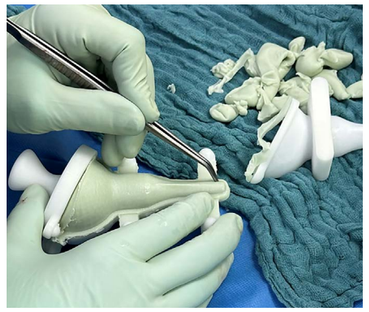
Images: Universitätsklinikum Münster

A VARIETY OF TECHNOLOGIES

The 3D-Center officially started operating on 2 February 2024. That said, the preparations had already begun back in 2022, and the summer of 2023 witnessed the delivery of the facility's beating heart: an SLS printer weighing in at 1.4 tons. Today, the 3D-Center has more than seven different plastic 3D printers at its disposal, which also support technologies like FDM, SLA, and DLP. The environment in which these machines operate meets all the requirements of manufacturing medical products – for instance, a constant ambient temperature of 21 degrees (C). The different printing technologies and individual process steps are also kept physically separate to prevent contamination. These safety precautions are so strict that of all the 11,500 employees at UKM, just a handful have access to its 3D printers.

REQUESTS ON THE RISE

As a partner to the various departments at UKM, the 3D-Center is far more than just an AM service provider. »We don't just 3D-print based on data; we handle the entire process needed to solve a given problem,« Dr. Schulze affirms.



Images from the operating table: Based on CT images, UKM 3D printed a mold consisting of several components. During the operation, the mold was filled with bone cement, which hardened quickly for rapid insertion

Powder Bed Fusion:
For further information on this procedure, check out the AM Field Guide at
» formnext.com/amfieldguide

In the months since the center opened, demand for its expertise has grown constantly within UKM. Each week brings five to 10 new requests from a wide range of departments. Not all of them turn into a project, though. »We always have to start by assessing whether we can meet the need in question in a way that makes sense,« Dr. Schulze explains, adding that the corresponding imaging has to be of a sufficient quality.

As for potential use cases for 3D Printing in medicine, he sees plenty – including in radiation therapy, where patient-specific skin protection can reduce the side-effects of such treatment. »There are all kinds of application areas you can consider, but you can't get started on all of them at once!«

CREATING A SPACER

Dr. Schulze performs operations himself on a weekly basis, relying on 3D Printing for complex procedures. A case he handled just a few weeks ago shows how helpful the technology can be. Severe inflammation had developed around a prosthesis a patient had received to replace her entire femur, along with the knee and hip joints. That meant the implant had to come out. »Treating inflammation like that is a complex and lengthy process. You have to wait until it has healed before inserting a new prosthesis,« Schulze explains. This is why a device called a »spacer« is typically inserted for the time being. »Until now, the standard procedure involved the surgeon creating a spacer by hand using bone cement,« Schulze continues. »That extends the duration of the operation, however, and the results aren't always good enough – especially with spacers as large as the ones needed for femurs.« He thus opted to have a mold consisting of several components printed at the 3D-Center prior to the operation. During the procedure, the mold was filled with bone cement, which dried quickly and enabled prompt insertion.

DIFFERENT FROM COMPANIES

Its focus on research, development, and excellence in medicine makes the 3D-Center quite different from most companies in medical technology. »Our 3D printers aren't used nearly as much, of course; production efficiency isn't the priority here. We're about research, development, and providing the best possible care to each individual patient,« Dr. Schulze points out.

The 3D-Center's director goes on to describe 3D Printing as more of a subsidized endeavor for UKM. Hospitals in Germany receive flat compensation for each operation they perform, but special cases like the one involving a 3D printed spacer aren't covered in health insurers' billing catalogs. That said, 3D printed solutions are typically only used in highly complex and difficult situations at UKM – meaning for operations most clinics would need to subsidize anyway.

»LIVES HAVE BEEN SAVED«

»From a moral perspective, we can't always question how profitable a given procedure is,« Dr. Schulze says. »After all, we're often entering uncharted medical territory in our 3D Printing.« In Münster, patients have received treatment after having been classified as inoperable by other clinics. »When you get right down to it, lives have been saved,« declares Dr. Schulze, who recalls one particular case involving heart surgery on a child. »It was initially a question of whether operating was even possible. Eventually, we were able to reevaluate and plan the procedure thanks to a 3D printed model.«

That's not the only reason why Schulze believes that this technology will take on a much greater role at clinics in the future. »As experienced doctors retire, we're facing a shortage of medical expertise,« he says. 3D Printing could thus help maintain a high standard of care, and it can bring its benefits to bear in smaller clinics, as well. »When the cost of an operation is estimated at €60 per minute and a single operating model can already help reduce the duration of the surgery by an hour, it's definitely worth it,« Schulze explains, adding that less time spent under anesthesia also reduces the risk of complications.

FURTHER INFORMATION:

» uni-muenster.de
» formnext.com/fonmag

ECONOMIC ADVANTAGES OFTEN OVERLOOKED

Additive Manufacturing of individual parts and small batches for medical technology opens up interesting possibilities

Above:
A medical microinstrument
At right:
A single-use component 3D printed from PA12

Patient-specific 3D printed applications have been in the limelight for years. In addition to the wide range of individual solutions possible, the strength of 3D Printing in medicine lies in the production of single parts and small batches according to Jurgen Laudus, vice president of Materialise Manufacturing. »Additive Manufacturing can also reduce the cost of one-off and small-series parts by taking retooling out of the equation. Given the push for personalized solutions, many medical technology companies have overlooked 3D Printing's economic drivers when it comes to small-batch production. However, the benefits for medical device companies and the health facilities purchasing their products are obvious.«

Laudus believes that this is an interesting business opportunity for AM manufacturers, as components without design changes in small quantities are the »unsung heroes« that play an important role in patient care – including in the manufacture of general diagnostic and treatment instruments.

»CHEAPER TO THAN IN TRADITIONAL MANUFACTURING«

In contrast to many other industries, the medical sector is unique in that even when a solution helps only a small number of patients, it still has to be available. All diseases, including very rare ones, require diagnostics and treatment, as well as the corresponding equipment. Laudus sees the great advantage of AM in the production of the small quantities required. »Small series of simple parts are cheaper to 3D-print than to produce in a traditional manufacturing environment due to cost savings related to retooling and training,« he points out.

This is especially helpful when a medical facility needs to replace a broken part for a piece of hospital equipment, or when a medical technology company is making only a few hundred of a specific type of diagnostic tool.

MORE THAN 150,000 3D PRINTED PARTS PER YEAR

Materialise produces more than 150,000 3D printed parts for the medtech industry every year, not including patient-specific applications. The company handles everything from design to the certified manufacturing of parts and works with 28 of the world's top 30 medtech manufacturers. Laudus cites its collaboration with Sartorius (which began in 2018) as an example of its success with additive small series. More than 26,000 disposable components have been produced for end consumers. In addition, 3D printed components supported the manufacture of equipment for producing mRNA COVID-19 vaccines. Meanwhile, MMI – a young company that has developed the world's smallest micro-instruments for wrists and a robotic technology for reducing tremors – has benefited from AM in realizing its design iterations and prototypes faster.

Images: Materialise

+ FURTHER INFORMATION:

» materialise.com

» formnext.com/fonmag

A QUESTION OF ENERGY AND HOW IT'S USED

Text: James Woodcock

Is Additive Manufacturing a sustainable method of production? How can this technology help improve one's ecological footprint? We've analyzed the factors that determine the answers to questions like these.

There are three angles we can look at when we talk about sustainability and Additive Manufacturing (AM). First is the sustainability (or otherwise) of the technologies themselves, for which we must consider the supply chain, the machine manufacture and operation, the resources consumed, the energy required and the waste streams created. Second is the impacts that AM can have on traditional manufacturing chains in terms of overall sustainability, including helping to improve efficiency of existing manufacturing chains. Third is the sustainability implications of additively manufactured parts in their end-use life.

Each of these three topics encompass a vast number of variables to measure, trade-offs to balance and angles to explore.

SO, HOW SUSTAINABLE IS AM AS A SET OF PROCESSES?

Evaluating the environmental sustainability of any process is very sensitive to the scope of the exploration. Taking a view that is too narrow or too wide can prove or disprove pretty much any hypothesis and leaves room for interpretation. For AM this is compounded by the fact that we could be talking about any one of a dozen processes, from hundreds of vendors, working any one of a thousand materials.

Some fundamental principles apply across the board however. All AM processes use energy — some more, some less — and how this energy is generated contributes a great deal towards the overall sustainability picture. Running an energy intensive process on renewable electricity could be more sustainable than a more efficient process reliant on fossil-fuel derived power.

Materials too play a role. Virgin materials come with 100% of the extraction, processing, and transportation impacts. Recycled materials can be better, but »

Images: YouMawo, Caracol, Adidas

EOS, YouMawo, and Fraunhofer EMI have calculated the ecological footprint of the YouMawo sunglasses pictured below and found that making them produces 58 percent less carbon emissions than a comparable pair

that depends on the energy needed for the recycling process (and again where that energy comes from is crucial).

As an example of the complexity of the situation, consider also the construction of the machines themselves. In seeking to keep the weight of the system down, aluminum may be used for the structural elements. Replacing this aluminum with steel would drastically reduce the carbon footprint of the machine build (~1.9–2.8 tons CO_2 per ton of steel vs ~11.5-13.00 tons of CO_2 per ton of aluminum), while slightly increasing the carbon intensity of the usually minimal movement of the system to the end user.

Ultimately, AM delivers sustainability benefits most when sustainability is considered at the conception and design phases. Re-designing existing parts — or simply using AM technology to create a part previously produced another way — can only ever have a relatively minor impact on the sustainability profile. By 'designing for AM', manufacturers can make the most of the opportunity to only use the materials where it is required.

MATERIALS IN FOCUS

During Formnext 2023 in Frankfurt, sustainability was really front and center for many of the larger companies. Almost every exhibitor had a sustainability story to tell whether it was front and center to their exhibition booth or hidden in the details. Perhaps with an understanding that the processes themselves really need to be qualified on a case-by-case basis exhibitors' sustainability stories majored on materials and applications.

Plastics — and specifically plastic waste — is a major focus of the wider sustainability charge worldwide. For the AM world, this offers both challenge and opportunity. As an example, photopolymers have historically been impossible or exceptionally difficult to recycle. While the parts made with photopolymers may have benefits in their real-world use, the waste generated is unfortunately just waste. Incineration and landfill are the only viable means of disposal today.

A number companies are forging ahead with bio-polymer based photopolymers that have improved recyclability and are less onerous to dispose of. For existing materials strides are being made to remove or reduce the carbon footprint at the point of sale, to improve recyclability and to create circular waste streams.

The use of pellets as feedstock for polymer-based 3D printers also opens up sustainability opportunities for manufacturers. Not only is the feedstock less heavily processed before printing (i.e., extruded into filament, wound, etc.) but pellet systems can more easily use directly recycled polymers that have been ground to the correct size profile.

For metal AM, materials are the biggest source of frustration and opportunity. For the most commonly used metal AM technologies, materials must be powdered and have specific morphologies and chemistries. Traditional metal powder production has a high environmental impact to start, but for AM applications this is further exacerbated by the relatively low-yield of usable material. Each kilogram of AM powder therefore bears not only the environmental cost of its own production therefore, but also the cost of unusable powder that may need to be re-processed as great environmental and economic cost.

This was not lost on any of the exhibiting companies and each was keen to demonstrate their unique take on the challenge. For some, the ability to tap into local renewable power immediately positively impacts their carbon footprint when compared with a fossil fuel powered competitor, even if the process is the same. For others, development of high-yield, energy efficient and flexible platforms provide an opportunity to help downstream customers. And across the show floor recycling of end-of-life parts, scrap and out-of-spec material was a consideration, especially for high value metals and alloys.

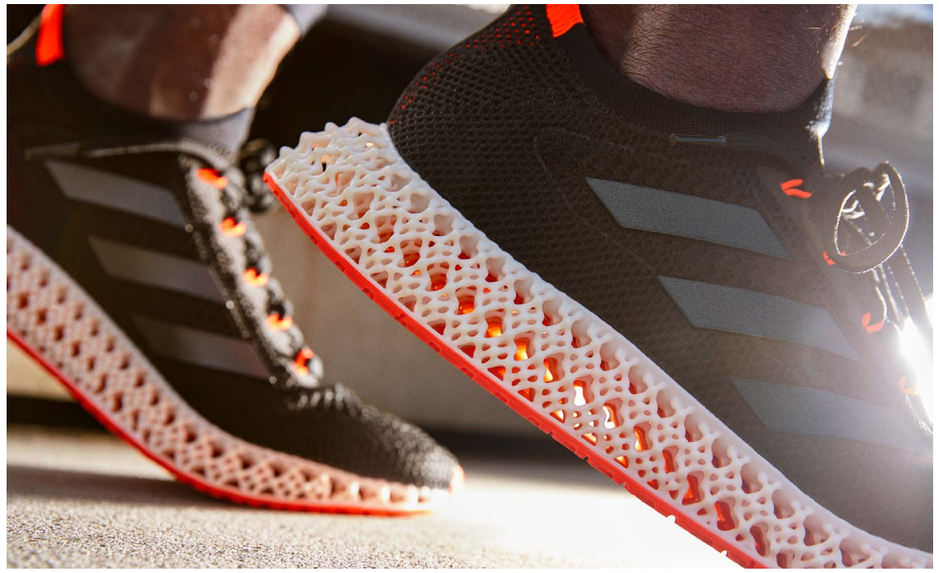
REDUCED IMPACT APPLICATIONS

AM remains a potential net benefit for those looking at commercial and environmental sustainability because of the unique ability to create parts that would otherwise be impossible. Anyone who has more than a passing interest in AM will be well aware of the myriads of topologically optimized, bio-inspired and otherwise natural looking geometries that go hand-in-hand with the technology.
It is this design freedom and the potential for additively manufactured parts to be lighter, stronger and more resistant to heat and wear that opens up huge opportunities for the sustainable manufacturing sector.

One of the best know examples is in aerospace, where weight is one of the enemies of efficiency. By harnessing the design freedoms opened up by AM, manufacturers can shave weight from components that may have a lifespan of decades. Every flight that makes use of these parts has a lower fuel consumption which, when considering the percentage of time an aircraft is airborne and the anticipated service life, adds up to significant savings.

The exhibition floor proved that AM companies are looking more holistically at the sustainability challenges and their role in providing the solution. Life cycle analysis of parts is becoming much more of the sales strategy that in previous years, with a real focus on the cradle-to-grave impacts of additively manufactured parts and components.

Caracol and NextChem are collaborating on the Beluga project, which involves a sailboat that was 3D printed in a single piece from MyReplast recycled polymer



These Adidas running shoes show how 3D Printing is opening the door to mass-market success. They feature a midsole printed from EPU 44 carbon, a 40-percent bio-based material

THE BIGGER THE PART, THE BIGGER THE (POTENTIAL) BENEFIT

Applications in AM are often limited by the build volume of the AM equipment deployed, however a number of larger systems catering for both metallic and non-metallic printing (e.g., Large Format AM (LFAM) and some Directed Energy Deposition (DED) systems) are available in the market.

Tackling larger components highlights the potential sustainability of AM processes in a number of ways:

- Where a large part if subtractively manufactured, the resulting waste stream is proportionally higher. Here AM's ability to use just the material needed can result in substantial savings of time and material, and reduce waste streams.
- Larger parts also pose challenges for logistics, and the ability to manufacture at or close to the required deployment site is extremely beneficial. Shipping, handling, and storage of large parts is responsible for a significant proportion of their environmental impact.

A BIG PICTURE, WITH FINE DETAILS

AM offers a potentially transformative pathway to reshape how we produce, consume, and think about the lifecycle of our products. Deployed well it can minimise waste, optimize design for efficiency, and make the most of sustainable materials. With the renewable electrification of industry and circular economy principles adopted within the AM sector, it becomes clear that this technology is not just a tool for creation but a potential beacon of sustainable progress. With pressures coming from end users, supply chain partners and regulators, AM's sustainable future looks bright.

Ultimately the breadth of AM technologies, materials and their applications make sweeping generalization both difficult and not especially useful. Each time a process is put to use the myriad factors involved must be considered when thinking about sustainability.

Getting green energy is a good start, designing to maximize the benefits of the production method certainly helps, and leveraging the ability to manufacture close to the point of need is crucial.

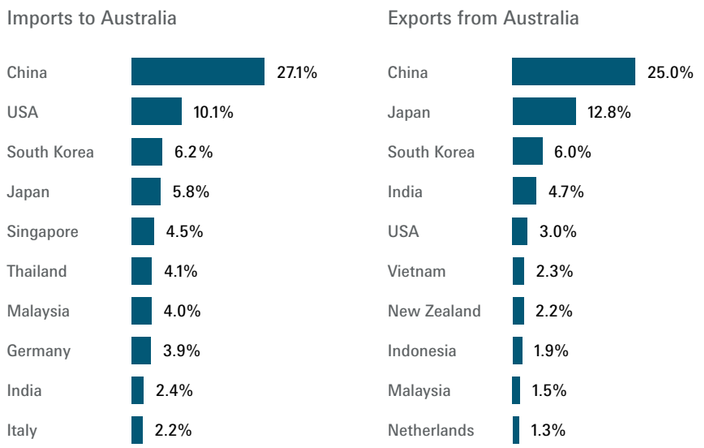
+ FURTHER INFORMATION:
» formnext.com/fonmag

KEY TECHNOLOGY OF NATIONAL INTEREST

Additive Manufacturing is playing a key role in the ongoing development of Australia's industry – which is why it receives corresponding support

Text: Matthew Wood

Image: iStock/shannonstent



Australia's leading trade partners in terms of import and export percentages

Sources: Handelsblatt, UN Comtrade

Australia's manufacturing industry has undergone significant transformations over the past few decades. Once dominated by traditional industries such as automotive and white goods, the sector has seen a shift towards advanced manufacturing technologies, including Additive Manufacturing (AM). This shift is driven by the need for innovation, sustainability, and global competitiveness. Additive Manufacturing, with its potential for customization, reduced waste, and localised production, has emerged as a critical component of Australia's manufacturing landscape.

The Australian manufacturing industry has historically played a pivotal role in the nation's economy. As of the latest reports, the manufacturing sector contributes approximately AU$100 billion to the Australian economy and employs over 900,000 people. The industry is diverse, encompassing sectors such as machinery and equipment, metal products, chemicals, medical devices, and food and beverage.

However, the sector has faced numerous challenges, including competition from low-cost manufacturing countries, a relatively small domestic market, and high labour costs. These challenges have necessitated a focus on advanced manufacturing technologies and innovation to maintain and enhance the sector's competitiveness.

RESEARCH DRIVES DEVELOPMENT

The adoption of Additive Manufacturing in Australia can be traced back to the early 2000s, with universities and research institutions leading the way. Organisations such as CSIRO have been instrumental in advancing AM technologies through research and development. One of the early success stories in Australian Additive Manufacturing is the establishment of Lab 22 by CSIRO. Lab 22 serves as a hub for innovation, providing access to state-of-the-art AM facilities and expertise. This initiative has helped numerous Australian companies explore and adopt 3D Printing technologies, leading to breakthroughs in various industries, including aerospace, medical devices, and automotive.

Australia's robust research and development (R&D) framework has been a critical driver of innovation in Additive Manufacturing. Along with CSIRO, numerous universities including RMIT, the University of Sydney, and Monash University have established dedicated AM research centers. These institutions collaborate with industry partners to advance AM technologies and develop new applications. For instance, RMIT University's Advanced Manufacturing Precinct houses cutting-edge 3D Printing facilities and has been pivotal in developing new materials and techniques for AM. The University of Sydney's Sydney Manufacturing Hub, launched in 2021, features state-of-the-art equipment for metal and polymer AM and fosters collaboration between academia and industry.

KEY AM COMPANIES CONTINUE TO GROW

The key players in the industry, including SPEE3D, Titomic, AML3D, Conflux, and Additive Assurance, marked significant milestones and experienced growth in 2023.

SPEE3D made notable advancements in the defence sector, achieving multi-unit sales to five global Defence Forces. They demonstrated the robust capabilities of their machines in extreme conditions, successfully printing metal parts at –20 degrees during the US DoD Point of Need Challenge. Additionally, the shipment of the first XSPEE3D to the UK MTC, which is now showcasing the technology across Europe, was a pivotal moment. »

Matthew Wood
is Trade Manager Manufacturing and Defense for the Australian state of Global Victoria

Conflux Technology also achieved several milestones, including launching two new heat exchanger products, securing AS9100D certification, and announcing a serial production customer for a gas-liquid heat exchanger. Conflux received funding from the Australian Space Agency's Moon to Mars Initiative to develop a heat exchanger for rocket engines and from the Australian Research Council to advance nanomaterial coatings and advanced plasma coating technology.

AML3D continued its focused growth strategy, supplying its proprietary Arcemy metal 3D Printing technology as a point-of-need manufacturing solution. They concentrated on industrial manufacturers in the US defence, marine, and aerospace industries while scaling up their presence in the USA. This focus led to key milestones, including contracts with the US Navy and Department of Defense, Curtin University, Chevron Australia, and BAE Systems Australia. AML3D also signed a significant reseller agreement with Phillips Corporation, a leading US Federal Government sales partner, to grow its US-based business.

Titomic reinforced its position in the Additive Manufacturing sector, leveraging its core technology, Titomic Kinetic Fusion based on Cold Spray Additive Manufacturing (CSAM). Titomic expanded its CSAM activities in the aerospace sector, marked by the sale of a Titomic ISB system to Epcor and being selected as the supplier of cold spray systems for Airbus. These developments indicate a shift towards adopting cold spray for critical applications. Titomic also announced projects with Boeing and participated in Australia's launch of the SpIRIT satellite, the country's first scientific satellite in two decades.

Overall, the strong emphasis on R&D in Additive Manufacturing positions Australia as a leader in this rapidly evolving field, with significant contributions to technological advancements and economic growth. Additive Manufacturing is reshaping the Australian manufacturing landscape, offering new opportunities for innovation, efficiency, and competitiveness. From aerospace to healthcare, the technology is enabling the production of customized, high-performance components that were previously unattainable with traditional manufacturing methods. By embracing Additive Manufacturing, Australia is not only enhancing its manufacturing capabilities but also paving the way for a more sustainable and resilient industrial future.

ANNUAL GROWTH RATE OF 23.9 PERCENT

According to a 2023 report by the Australian Department of Industry, Science, Energy and Resources, the Additive Manufacturing market in Australia is projected to grow at a compound annual growth rate (CAGR) of 23.9% from 2021 to 2026. This growth is driven by increased investment in R&D, the establishment of advanced manufacturing hubs, and the growing adoption of AM technologies across various sectors, including aerospace, medical, transport and renewable industries.

Acknowledging the transformative potential of Additive Manufacturing, the Australian Government has designated Additive Manufacturing as a critical technology in the national interest, highlighting its significance as an enabling capability for advanced manufacturing. AM holds a prominent position in the priority areas outlined by the National Reconstruction Fund (NRF), emphasizing its importance in driving innovation and value creation across various sectors.

+ FURTHER INFORMATION:
» formnext.com/fonmag

Image: iStock / Melbourne – Jose Gomez Photography

BETTER ACCESS TO THE US MARKET

Titomic Limited of Brisbane, Australia, recently announced the sale of a $790,000 custom high-pressure cold spray AM system to the Oregon Manufacturing Innovation Center (OMIC R&D). Based in Portland, Oregon, OMIC R&D provides commercial research and development services to companies such as Sandvik Coromant, Boeing, and Daimler. Its experience covers a range of advanced metal manufacturing technologies, including particular expertise in Additive Manufacturing and alloy development. Its new system gives OMIC R&D the capabilities afforded by high-pressure cold spray Additive Manufacturing, which makes it possible to produce multi-metal parts, large-format titanium components, and multi-metal coatings. »At Titomic, we're excited about the progress being made with key players in the US aerospace and defense sectors,« says managing director Herbert Koeck. »After years of diligent work and testing, Titomic is now developing scalable commercial opportunities and establishing key relationships in an industry that's experiencing significant global investment from both government and private sectors. Our journey has just begun.« Meanwhile, this acquisition also enables Titomic to expand the reach of its R&D initiatives by providing US-based industry with access to cold spray Additive Manufacturing through OMIC R&D. This is meant to generate further awareness of the benefits of the technology.

EBM PRINTERS FOR THE AEROSPACE INDUSTRY

The University of South Australia (UniSA) has opened a new advanced manufacturing facility in Adelaide and announced four space research projects in which Additive Manufacturing plays an important role. In total, the projects have received more than AU$18 million in funding. The facility will support the industry with metal Additive Manufacturing for space structures and house six GE Arcam (now Colibrium Additive) EBM machines, among other systems. These will be used to 3D-print alloys containing metals such as titanium and nickel, which are critical to space technologies. Deputy Premier Susan Close officially opened the 3D Printing center, which is located at VPG Innovation (part of the Stärke-AMG group) in Adelaide's Camden Park. »As we transition from resource-intensive manufacturing to more research-driven and energy-efficient processes, we will produce more high-value products,« Close said. »This 3D Printing technology makes it possible to rapidly manufacture custom-made parts and other space infrastructure that can save businesses time and cost.« The first four UniSA projects will include Additive Manufacturing of space components and the production of novel materials for optical components and satellite assemblies.

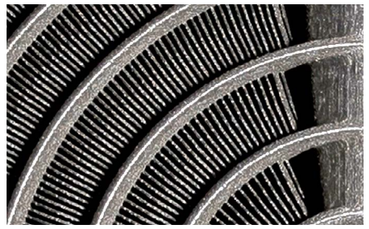
Image: UniSA

SPEEDING UP THE DEVELOPMENT OF 3D PRINTERS

Visionware3D, a Sydney-based provider of 3D Printing software, has introduced a software platform designed to streamline the development of 3D printers. According to the company, Z-Engine is modular control software that drastically reduces the time and resources required to develop such printers. It provides out-of-the-box support for 3D Printing workflows and is compatible with a wide range of printers, from low-cost consumer models to high-end industrial machines. Visionware3D also states that Z-Engine is suitable for both companies developing new 3D printers and established firms that are looking to move away from legacy code and add specific functionality. Until now, developing a 3D printer has been an elaborate and expensive endeavor. Companies typically face complex technical challenges, as they need to develop and integrate software and hardware elements such as motion control, slicing, and user interfaces. Z-Engine removes these hurdles while being platform-independent: It runs on both Windows and various Linux-based embedded systems and provides APIs compatible with C/C++ and other languages. The engine also supports multiple printing technologies, including FDM, SLA, SLS, inkjet, DLP, and MSLA. The Z-Engine software includes Z-Slicer, motion control, I/O management, and optional modules such as projection system interfaces (DLP and MSLA), jetting system interfaces (inkjet), and Z-Inspection (an integrated inspection system).

EXOTIC DESIGNS FOR A MARKET WORTH BILLIONS

Conflux prints heat exchangers for the space industry, motorsports, and many other sectors



With his company, Conflux, Michael Fuller has specialized in one specific thing: 3D Printing heat exchangers. The 48-year-old sees so much potential for this that he's not even thinking about other products. »The market for heat exchangers is worth billions, and the potential for using Additive Manufacturing to make them continues to grow. This is due to the fact that AM is becoming more and more efficient and therefore cheaper, which means it's continuing to improve its position in competition with other production methods. The market is so big, I don't have that many years left to really exploit it,« says the father of four.

Text: Thomas Masuch

Images: Conflux

Before founding Conflux, Fuller had worked as an engineer in fields like motorsports, where he gained years of experience in Additive Manufacturing. The reason why he then started his own company in his home country isn't hard to figure out. »Just look at Google Maps: We're 15 minutes from Bells Beach, and Australia has a really well-educated workforce.« The distance to the most important customers in Europe and the USA means that Fuller spends a lot of time on planes and in hotels, but he says it's »absolutely worth it«.

Starting out, Fuller and his team were quite straightforward and pragmatic. »We went to Formnext as visitors, brought heat exchangers with us, and asked companies if they needed one,« Fuller recalls. This has since changed dramatically: The company, whose investors include AM Ventures, now has 22 employees and has had its own stand at Formnext for the past two years. Incidentally, the Frankfurt event is the only AM trade fair Conflux attends. Otherwise, the Australian company is only present at events that focus on heat exchanger solutions. »Formnext is extremely worthwhile for us; we had over 200 leads last year,« Fuller reports.

SCOPE OF SERVICES

Conflux's services range from design to 3D Printing (on two EOS PBF systems) and quality control, which includes checking that the dimensions are correct and that no powder residue remains. »The latter in particular isn't so easy due to the very delicate structures and narrow cooling channels,« explains Fuller. Along with his engineers, he wants to further improve the company's expertise in the future, focusing primarily on practical applications. »We're looking for the most efficient shapes. They're not always sexy, which disappoints some AM experts, but Additive Manufacturing also has to follow the laws of physics.«

Not every heat exchanger that Conflux manufactures is unique, »but we still work with very small quantities,« Fuller points out. The number of heat exchangers an order ultimately comprises usually depends primarily on the dimensions of the components, which vary from the size of a fingertip to 400 mm in diameter. Conflux usually supplies small series of between one and 10 components, or as many as 500 units.

Powder Bed Fusion:
For further information on this procedure, check out the AM Field Guide at
» formnext.com/amfieldguide

Conflux's machinery also includes two PBF units from EOS

EXOTIC DESIGNS

The great potential of heat exchangers lies in the fact that practically every machine has at least one – from computers to 3D printers themselves. But for which systems does it make sense to 3D-print heat exchangers? »Wherever exotic designs are required,« explains Fuller. This is the case in aircraft construction, for example. »Weight savings are important here; every kilogram saved has a specific value and can therefore be easily calculated.« The same applies to the rocket industry, where the values associated with weight reductions are even higher. Here, 3D printed heat exchangers are used in both rocket construction and payloads (satellites).

Meanwhile, motorsports represent another important customer group for Conflux. »The main focus here is on the rapid development of aerodynamics. If the design teams can quickly tell what components look like under the surface, they can also better optimize the designs,« Fuller says. Other applications include hydrogen drives, semiconductor production, and data centers.

The development of 3D printed heat exchangers depends on the application and industry in question. »Customers usually come to us when they have developed a heat exchanger provisionally themselves and are now looking for a good replacement,« explains Fuller. Things become more complex when very cold liquids are involved, for example, as is the case in rocket construction. »Here, we have to work hand-in-glove with our customers.« Conflux then creates a design study, sometimes with several iterations; only then does it proceed with printing the corresponding heat exchanger.

+ FURTHER INFORMATION:

» confluxtechnology.com
» formnext.com/fonmag

LARGE COMPONENTS WITH MICRON-LEVEL ACCURACY

Text: Thomas Masuch

At right:
Founder and CEO Marten Jurg speaks with co-founder Andrey Molotnikov in front of the Amiris system, which can be externally retrofitted to metal PBF printers or integrated into such units by the manufacturer

Additive Assurance has developed a flexible QA system for metal 3D Printing

Quality assurance is an essential part of the additive process chain, and the young Australian company Additive Assurance focuses on ensuring quality in the 3D Printing of metal components. Its solution, which was developed for L-PBF systems, and includes software, hardware, and an analysis tool that identifies defects to ensure part consistency. »Its unique sensor allows us to achieve an accuracy down to 30 microns across the whole powder bed,« explains founder and CEO Marten Jurg.

The Amiris system can either be retrofitted to customers' machines from the outside or integrated directly into systems by the manufacturer. The company has now developed suitable solutions for 12 different machine types, with more to follow. »We've also entered into cooperation agreements with various manufacturers,« Jurg explains. These manufacturers also see Additive Assurance acting as a preferred partner for quality assurance. »This helps machine manufacturers to close high-value sales for critical industries,« continues Jurg, who is particularly interested in the aerospace and defense sectors.

In 2019, Additive Assurance was founded out of Monash University in Melbourne by Jurg and Andrey Molotnikov. Prior to this, the aerospace engineer had worked in Germany (including for Airbus) and had already begun to build up an extensive network in the AM community.

GERMAN ROOTS

Its connection to Germany would also have an influence on the further development of the young company later on. For example, Additive Assurance was initially represented in the start-up area of Formnext for several years in a row and succeeded in establishing contacts with various partners and customers, including Volkswagen. The automotive group was one of the first industrial customers to purchase an Amiris system and has been using it in its AM center in Wolfsburg ever since. Co-founder Andrey Molotnikov also has German roots, and former Siemens engineer (and native German) Jürgen Schneider is on Additive Assurance's board of directors.

In 2021, the company introduced Amiris to the world, with US$1.6 million in venture capital funding from investors in Australia and the UK also serving as a driver of further growth. Two years later, the company scaled up its products with Amiris-LF, a process monitoring and quality control solution for large-format machines.

JUST A PHONE CALL AWAY

Formnext remains by far the most important trade fair for the young company, although it does take part in other events around the world. »Formnext is fantastic for making new contacts in all areas of the AM industry. The best thing is that there's always this exciting experience of so many people wanting to make new contacts and learn,« enthuses Jurg. »Even as an exhibitor, I always walk through the corridors and learn things I've never seen before.«

Additive Assurance's customers are mainly from the USA and Europe, with some also coming from Singapore and Japan. No wonder Marten Jurg is on the road around half the time, usually venturing out for several weeks six to seven times each year. He doesn't consider this a burden and views distance as »not necessarily a bad thing« – after all, many things can be discussed and dealt with digitally these days. »We may be on the other side of the world, but we're only a phone call away,« he points out.

For the native Australian, the attractiveness of his home country with its proximity to the sea, the city of Melbourne, and the very relaxed and friendly mentality of Australians also plays an important role for his company. »It's a great place to live, so it's quite easy to convince good people to work for you here. We also have a very good talent pool thanks to the excellent universities in Melbourne and other cities in Australia,« Jurg reveals. Plus, since the manufacturing industry in Australia is traditionally much less developed than in places like the USA or Europe, Jurg sees much less local competition for AM companies.

TECHNICAL DEVELOPMENT CONTINUES

Meanwhile, Jurg says that his young company has now built up a very good reputation in the world of Additive Manufacturing. This is also due to the fact that it »covers all aspects of the quality chain with the Amiris solution,« as he puts it. However, development continues unabated, and the next generation of AM quality control is now in the works, with Additive Assurance collaborating with various customers. Among other things, this involves comparing individual components in order to create identical duplicates. The company also plans to include data from CT scans in this analysis.

Images: Additive Assurance

FURTHER INFORMATION:

» additiveassurance.com

» formnext.com/fonmag

REVOLUTIONARY – LIKE BACH

Text: Thomas Masuch

A few weeks back, I once again had the good fortune of spending several days in Leipzig. For me, it's one of the most beautiful and livable cities in Germany – not to mention a treasure trove for history buffs. From Johann Sebastian Bach, who served as cantor of St. Thomas Church around 300 years ago, to the Monday demonstrations of 1989 that ultimately led to the fall of East Germany's Socialist dictatorship, Leipzig has plenty to offer in this regard. Incidentally, the latter remains the only revolution that ever succeeded in Germany.

While that type of spirit seems to have left the city today, something revolutionary did cross my radar while I was there: an announcement from the world of 3D Printing! In a press release, a very well-known producer of AM systems unveiled its latest model and made sure to point out that this printer would »revolutionize« Additive Manufacturing. It even claimed that production companies would be able to reconfigure their processes from the ground up. When I hear about promises as bold as these, the first thing I check is the date of publication. This, however, really was news from 2024 and not from a decade ago. Back then, there was no shortage of companies and self-proclaimed experts heralding – you guessed it – a revolution in production. From schnitzels to entire automobiles, everything would soon be popping out of 3D printers. Even start-ups that were bringing yet another affordable FDM printer to market saw themselves as forerunners in this revolution – which, by the way, was also poised to change every aspect of our daily lives. These pronouncements were surely aimed at potential investors, as well, and they did indeed help attract millions in financial backing. To this day, I wonder if those investors – particularly those in the United States – actually believed such promises. I suppose it wasn't even that important in the end, as long as the story was compelling enough to continue to attract people for the next funding round, or even for an IPO. A few years later, many of those big bets hadn't hit. The AM market was turning in constant double-digit growth, but the revolution was off, at least for the time being. Stockholders that hadn't managed to sell their shares in certain AM companies in time were among those left footing the bill. These developments did have a bright side, though: Significant capital was poured into the market, resulting in numerous technical innovations. Perhaps AM is less about revolution and more like Bach. Artfully melodic and borne by a constant rhythm, it's a technology that continues to captivate fans and imitators. This in turn is giving rise to ever more new and unique projects and creations. Some 300 years down the line, people will surely look back and see that AM led to significant advancements as it helped shape the world of production. I'm actually quite certain it won't take that long; even the most devout realist will tell you that there's a bit of revolution in AM after all.

Illustration: feedbackmedia.de, iStock/artbesour, erhui1979, sv-time, elenabs

FonMag

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