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3D ADEPT MAG

NEWS

INNOVATIONS & CHALLENGES

CASE STUDY & TEST

Interview

Konrad Głowacki

co-founder of **Sinterit**

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Editorial

From its creation to its real boom in the 2000s, 3D printing has become a technology without limits. Its advantages and its potential continue to attract professionals in every industry. Over the years, professionals have evaluated and discovered prospects of development in their field of work. This is probably the boost many sectors of activity need to evolve.

3D printing, between evolution and revolution?

With tremendous dynamism and a double-digit growth, the additive manufacturing market and its development potential keep growing. This market will represent more than 20 billion dollars by 2020.

Each sector of activity, medicine ($ 3.89 billion by 2022, or 22% growth according to Allied Market Research) electronics, fashion, aerospace, the food or the car industry (4.3 billion dollars by 2025) also sees its specificities develop. Be it by size of the achievements (from “nano” to “macro”), materials used (plastic, glass, metal or ceramics), or processes increasingly innovative, the 3D printing market will still surprise us with its innovations.

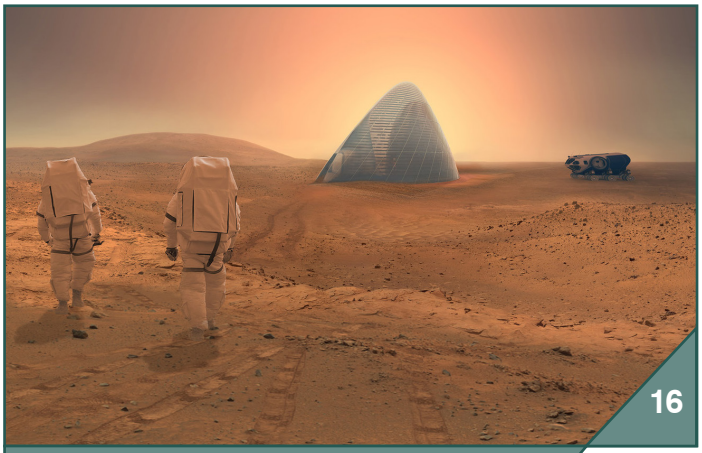
Today more than ever, questions are being raised. Industries and companies are raising questions about their activities, but also the average consumer: How can we make this profitable for us? How can we use it in daily life? Which material for which 3D printer? Which 3D printer is suitable for X project? And much more...

All these questions give 3D Adept Mag its raison d’être. Through this magazine, we choose to address the challenges encountered by market players, to tackle issues through the column “Dossier” while informing a curious audience, to discover 3D printing in all sectors of activity and projects both unimaginable and attractive, finally to give the floor to leaders, experts and specialists in this market.

Kety Sindze

Metallic 3D printing systems have already begun to create a world of new possibilities in the areas of development, design and production.

As part of its series of tests, the engineering department of 3D Adept carried out during one month the test of the da Vinci 1.0 Pro printer of the manufacturer XYZprinting.



NASA has kicked off the third phase of its 3D Printed Habitat Challenge, which encourages amateur inventors to come up with 3D printed solutions for human habitats on Mars.

Sinterit, manufacturer of SLS 3D printers, enters the market with Sinterit Lisa. Recognized for its "affordable" price, the printer firstly attracts by its design...

Overview

Desktop Metal develops its Metal 3D Printing Services throughout Europe

> We already see tremendous applications in our wide customer base, in Research/Education and in a wide range of industrial verticals, in both automotive and aerospace, as well as in every small and medium-sized business.

Desktop Metal, an international expansion for its Metal 3D printing Systems

Committed to making metal 3D printing accessible to manufacturers and engineers, Desktop Metal's efforts to keep this promise are increasingly visible on the market.

After completing a $115 million Series D investment round in July to further accelerate its rapid business growth and adoption of its end-to-end metal 3D printing systems, Desktop Metal marks a new step for its services: the European Market.

According to CECIMO, the European Association of Machine Tool Industries, *"the European advanced manufacturing industry has maintained over time a global leading position, and it can be considered a gem of the European economy. With the rise of additive manufacturing (AM) technologies on the shop floor, industry has entered a new round of innovation."* It is therefore no surprise that companies specialized in this industry which can afford a global expansion take advantage of this market to expand their services.

The specialist of metal 3D printing services has thus begun to accept international pre-orders of its metal 3D printing system, the Studio System™ from companies throughout Europe.

An increasing demand from manufacturers and strategic partners around the globe

Notice is to be made that if the company is going in that direction, it is precisely because the market presents a growing demand on this sector of activity.

The specialist of metal 3D printing is signing commercial agreements with international partners to develop this range of service.

Furthermore, these strategic partners will be a source of critical user feedback on benchmark parts, materials, training and system usage.

As far as the technologies are concerned, **Ric Fulop**, **CEO and co-founder of Desktop Metal** ensures that they will first offer services for their Studio System and later for their Production System.

"Our partnerships with best-in-class resellers in each of these geographies bring us closer to making metal 3D printing solutions available to all who want to realize the benefits of rapid prototyping and mass production of metal parts", said **Ric Fulop**.

Strategic partnerships have been signed with international resellers to begin pre-selling its Studio System throughout Germany, Italy, the United Kingdom, France and Spain. In total the company partners with 16 resellers throughout the EU, including LaserLines and Tritech 3D, as well as two of Stratasys' leading European premier partners, Alphacam and CADvision.

Those partners are already looking forward to supporting customers with Desktop Metal's 3D printing technology. Moreover, some of them already see tremendous applications in their customer base, in Research/Education and in a wide range of industrial verticals, in both automotive and aerospace, as well as in every small and medium-sized business.

BMW Group, first commercial agreement for Desktop Metal 3D printing Systems

Among the commercial agreements, one can mention BMW Group which is the company's first international early partner to receive a system. This is no longer a secret, metal additive manufacturing has already impacted the automotive industry mainly in prototyping.

The car manufacturer is firstly an early investor in Desktop Metal. Aware of the potential of 3D printing technology and its capacity to redefine manufacturing, BMW Group's independent venture unit aims to foster the startup ecosystem in order to take the automotive world to the next level.

They are currently looking for ways to develop the use of metal additive manufacturing in multiple applications, starting with design to cost-effective mass production, which is the most challenging application where material and process qualification, design, performance and cost-per-part, crucial for their success.

"Together with Desktop Metal, we are working on challenging the status quo of metal additive manufacturing. We are looking into uncovering the potential for both the Studio System for functional prototypes and the Production System for high-speed prototyping and mass production of BMW Group automotive parts," said **Jens Ertel** head of BMW Group's Additive Manufacturing Center in Munich.

EOS AND UNDER ARMOUR:

the dream team to develop advanced, scalable laser sintering 3D printing technology

Adidas, Peak, Nike and **Under Armour**, leading brands of the footwear industry successfully differentiate among other brands by launching 3D printed shoes. The one thing is that they were produced on a small-scale.

When Under Armour meets EOS

Under Armour started its 3D printing journey with **UA Architech** and continued with **Under Armour Architech Futurist.**

During formnext, the leading trade fair in additive manufacturing, the sport brand realizes it shares the same innovative vision with EOS, one of the leading suppliers in industrial 3D printing.

Both organizations join forces to scale Under Armour's 3D footwear business through the development of advanced laser sintering technology, and leveraging EOS' expertise in industrialized 3D production, or additive manufacturing (AM).

Thanks to EOS' laser sintering 3D printing technology, Under Armour will be able to deliver shoes to the marketplace in a meaningful way. The company aspires to create truly amazing, desirable products which might solve their customers' needs in ways that could have never been imagined before.

Technically speaking, Under Armour will make use of EOS 3D technology to print powder-based parts. Furthermore, both partners will work together on polymer powder development and on advanced laser sintering platform development.

Another positive point of the story is that **EOS' Additive Minds expert services** will enable Under Armour to improve its additive manufacturing program.

«This partnership is set to achieve Under Armour's goal to industrialize and scale 3D printing of performance footwear,» said **Glynn Fletcher**, President of EOS North America. *«True additive manufacturing has come to Under Armour; no other athletic brand can make this statement.»*

For **Clay Dean**, Chief Innovation Officer, Under Armour, their *«two organizations make a formidable pair».*

GE Additive acquires GeonX to strengthen software simulation capabilities

GE Additive announced that it has acquired GeonX, a privately-owned developer of simulation software. Terms of the deal are not being disclosed.

Headquarted in Belgium, GeonX provides software for engineers when developing new products, to simulate additive manufacturing, welding, machining and heat treatment processes in various industries such as aerospace, automotive and energy.

GeonX's simulation software tool, Virfac® (short for Virtual Factory), assesses products prior to production; predicting defects, distortions and stresses and the impact manufacturing has on a product's durability. This helps to reduce the number of prototypes built during the development phase, while improving the quality and lifetime of the manufactured products. This can reduce the time allocated to commercialisation and development costs.

Mohammad Ehteshami, Vice President and General Manager of GE Additive said, *"As a business, GE Additive is committed to accelerating the additive manufacturing industry. Innovative simulation software solutions like Virfac do just that by adding real value to our customers who want to speed up product design and development, while maintaining the best possible quality. We're delighted to welcome GeonX to the GE Additive family."*

Laurent D'Alvise and **Michel Delanaye**, co-founders and CEOs, GeonX said, *"GE Additive is the innovator in the additive manufacturing sector and we're thrilled to join the team. Software is of course integral to digital transformation, so we are equally excited to be part of GE's Digital Industrial journey."*

For many years, GE has been a leading end user and innovator in the additive manufacturing space. In addition to the $1.4 billion investment in Concept Laser and Arcam, GE has also invested approximately $1.5 billion in manufacturing and additive technologies over the past 10 years, developed additive applications across all GE businesses, created new services applications across the company, and earned hundreds of patents in material science. In 2016, the company established GE Additive to become a leading supplier of additive technology, materials and services for industries and businesses worldwide.

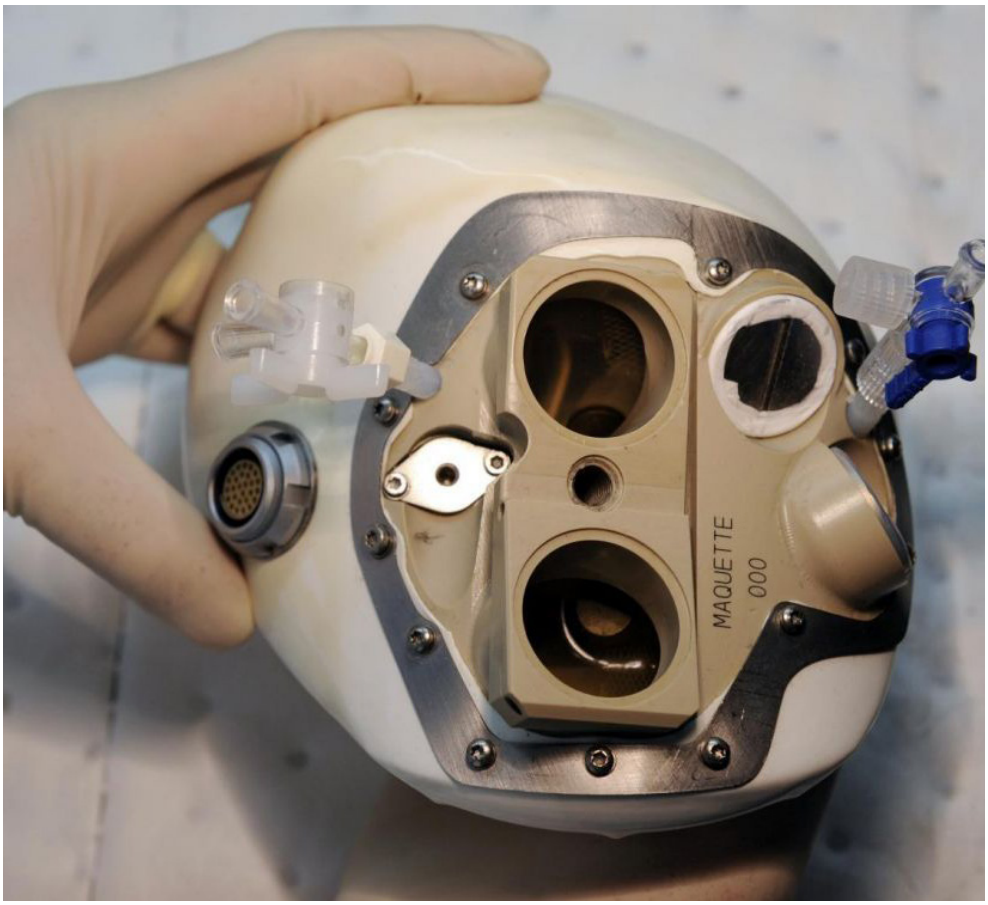
CARMAT & AddUP bring 3D printing in the «CARMAT project»

A partnership that will accelerate the industrial phase of the CARMAT project

CARMAT and **AddUP** join forces to support the industrial development of the CARMAT's heart.
The reality is that **26 million people** suffer from heart failure in the world and a prevalent lack of heart donors.
Both companies therefore aim to increase CARMAT's production capacity in order to manufacture on a large scale.
Before going any further, let's point out that AddUP is a joint venture specialized in 3D printing set up by the Michelin and Fives groups. The company develops and commercializes worldwide machines and industrial production lines using metal 3D printing technology.
Acknowledged as the world's most advanced artificial heart project, CARMAT is active in the development of its total artificial heart and aims to provide to solutions to the shortfall in heart transplants for the tens of thousands of people suffering from irreversible end-stage heart failure.

What can we expect from this partnership?

Both companies follow the example of **ETH Zurich** which announced in June 2017 the use of 3D printing to create a **silicone artificial heart** in a feasibility test.
This agreement will firstly strengthen the industrial development of the CARMAT heart. Indeed, thanks to AddUp's 3D printing technology, CARMAT's surgeons will be able to optimize anatomical interfaces leading to enhanced anatomical compatibility and surgical comfort on the one hand; on the other hand, the number of components will be reduced, therefore providing more safety when assembling the device.
Furthermore, this collaboration will enable CARMAT to improve its production capacity in order to prepare the large-scale production phase.
For **Stéphane Piat**, CEO of CARMAT, adds: *"The CARMAT project has been, since the beginning, a perfect example of cooperation between the industrial and medical fields. The partnership agreement signed today with AddUp is an additional proof and will enable us – alongside our ongoing clinical development – to anticipate longer-term evolutions in our industrial and technical needs. With a partner as prestigious as AddUp, I am convinced in our ability to accelerate our industrialization and secure our project."*
Last, the involvement in such a project is also a big opportunity for **Vincent Ferreiro**, CEO and Chairman of AddUp who is very proud of the company's 3D printing solutions: *"We possess a know-how in providing support to our partners from the feasibility stage to the industrialization of concept ideas. We are very enthusiastic about the ability to apply it to the medical field for the first time."*



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Materialise and Siemens bring 3D Printing to hospitals worldwide

A partnership which expands availability of Materialise Mimics inPrint software Materialise and Siemens announced a commercial agreement to bring Materialise Mimics inPrint software to hospitals from all over the world.

For those who do not know them, Materialise is one of the pioneers which provides 3D printing services and software solutions worldwide whereas Siemens is a medical technology company.

Active in a wide range of sectors (fashion, sports, etc…), Materialise strongly believes that 3D printing is going to revolutionize the medical industry, that's why the company is always looking for ways to make its software accessible to more patients and hospitals

The Mimics inPrint software: advantages and use

The Mimics inPrint software is a solution that will enable radiologists to print anatomical models in hospitals. It will be available through the **Siemens Healthineers syngo.via ope n app platform.**

Adopting virtual 3D anatomical models facilitates surgical planning and collaboration between radiologists and surgical teams.

Furthermore, 3D printed anatomical models improve the patient care, as well as training and education surrounding anatomically complex pathologies.

Brigitte de Vet, Vice President of Medical at Materialise affirms that *"by partnering with other global healthcare leaders like Siemens Healthineers, we can [improve patient care], and more importantly, we can further contribute to a better and healthier world."*

Speaking technically, once Mimics inPrint is integrated into the standard hospital workflow, the patient receives a more personalized care through Materialise's 3D printing solutions. Through the software, it becomes much easier for 3D printing to be integrated within clinical environments on the one hand, and to contribute to better quality, cost-efficient care for both patients and hospitals.

This is what **Valentin Ziebandt**, Head of Marketing at the Syngo Business Line at Siemens Healthineers explains:

"By incorporating 3D technology into syngo.via, we jointly support the entire workflow from patient diagnosis to therapy planning. This is a cost-effective way to increase the clinical capabilities of syngo.via and an important step towards achieving personalized care and precision medicine."

3D printing in the medical sector

3D printing is increasingly paving the way to new ways of healing patients. Researches and developments are being carried out to explore opportunities that 3D printing can offer in this sector of activity.

From the creation of an artificial heart, to possible solutions to fight against kidney cancer…illustrations are really numerous in this sector of activity.

The point of view of Dr. Frank Rybicki, Professor and Chair of Radiology, University of Ottawa; Chief of Medical Imaging, the Ottawa Hospital

For Dr. Frank Rybicki, 3D printing increasingly plays a key role in a great number of cases where advanced imaging is required.

Simply put, hospitals need two things to integrate 3D printing in their workflow: expertise and tools. Well, expertise depends on the experience and the skills of those who are working with this technology and tools are essential for expertise to make patient care effective.

The chief of medical imaging clearly lays emphasis on the fact that it is not all about creating a 3D model of the heart from a CT scan, it is mostly about finding the suitable software package for the clinical basis. As he precises: *"it's not an experiment that you tweak and bring back 3 days later: it's about real clinical patients"*, hence the importance for 3D printing to suits their clinical workflow.

As for the hardware, it should consist in a piece of equipment that should do enough printing to be useful for the group.

Lastly, one should not underestimate the role of radiologists. Indeed, they are in charge with images, models generated from MRI scan which constitute the majority of 3D printed medical models. Therefore, their involvement then becomes essential in 3D printing.

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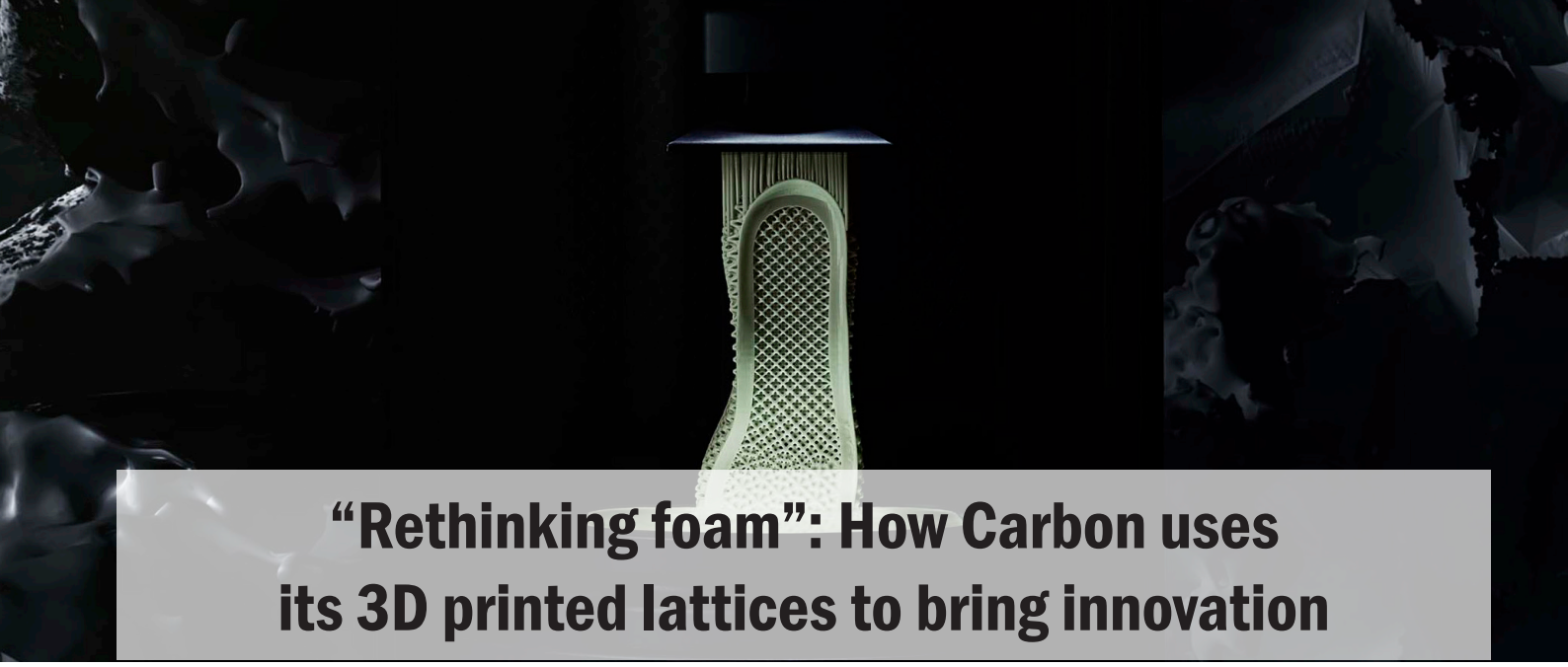

“Rethinking foam”: How Carbon uses its 3D printed lattices to bring innovation

80 years after the discovery of polyurethane foam chemistry by Dr. Otto Bayer, industries have realized the importance of foam for different applications: automotive, packaging, construction, electronics, bedding, and furniture. Combined with 3D printing, this material can bring unexpected benefits.

Driven by its 3D printed lattices, Carbon brings a significant impact in the foam sector. The elastomer lattice innovations take advantage of proprietary programmable resins and software capabilities. Indeed, the capacity to 3D manufacture finely tuned lattices could drastically improve the user experience around the combination of comfort, performance, and safety of foam applications—products we all touch and feel every day..

First of all, what is Carbon’s lattice solution?

Carbon’s technology makes it possible to produce lattice geometries with functional elastomeric materials. The thing is that product designers using lattices require software tools to optimize the ideal lattice parameters in their design (unit cell type, shape, and strut size for instance); the goal being to obtain the desired mechanical response and manufacturability of the part.

With the solution of the manufacturer, it is possible to remove the guesswork from the design process.

Indeed, instead of the trial-and-error process associated with conventional lattice prototyping tools, this new approach requires only the submission of the desired mechanical response for parts and other design constraints, such as weight and size.

Using Carbon’s library of metamaterials, the software tool outputs a lattice structure that meets the mechanical loading requirements of the part, and checks for manufacturability. Furthermore, the tool allows distribution of different mechanical properties within the same part, enabling multiple functional zones (see Figure 1 below).

Figure 1: Carbon’s lattice solution workflow showing inputs and output

STATUS QUO WITH FOAM AND CARBON'S DIFFERENTIATION

CONFORT

This term might seem subjective to you but over time, researchers have implemented a method to quantify comfort, using blind tests and statistical tools. Among the numerous existing materials to optimize product comfort, foam remains one of the most versatile and widely used choices.

For applications such as seats and headsets, this material enables a variety of performance characteristics based on factors such as composition, placement, and thickness.

However, one limitation remains in all traditional approaches to foam design and experimentation: compression force applied to foam increases linearly (Figure 2), resulting in severe design constraints.

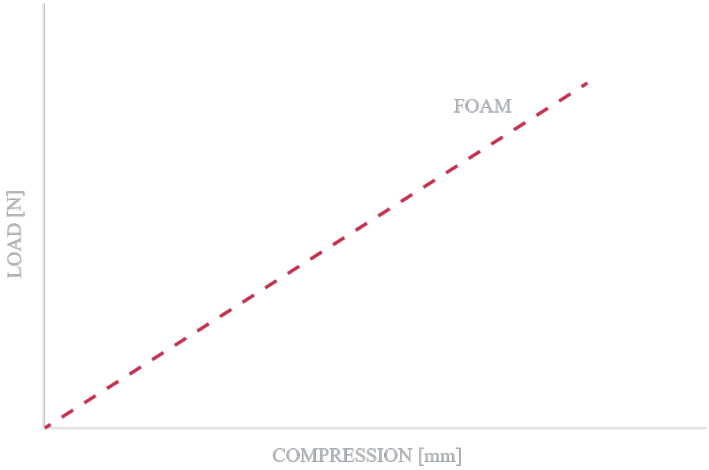

Figure 2: Linear relationship between load and compression for foam

To tackle this issue, closed-cell elastomeric foams have been developed and they allow a more non-linear load-compression response (Figure 3 below).

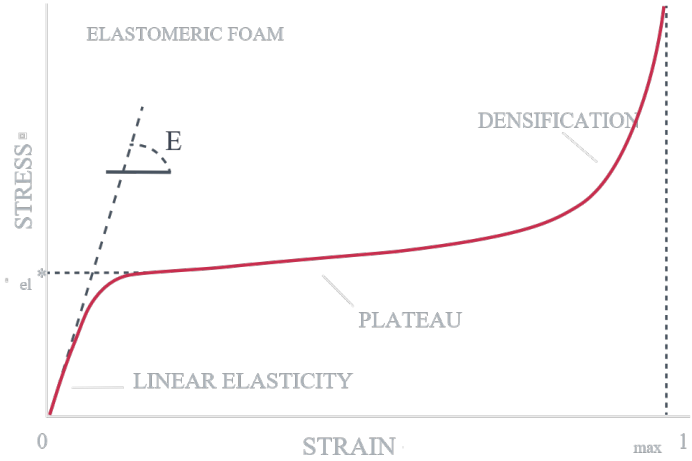

Figure 3: Schematic compressive stress-strain response of closed-cell elastomeric foams

With this approach, the central plateau helps deliver an almost constant load within the same piece of foam, resulting in a product that can be used comfortably across a broader set of users.

However, this increase in compression performance comes at a sizable cost: these closed-cell foams lack breathability, and as a result, demonstrate the thermal profile of an insulator. For users interacting with these foams, the closed-cell approach results in discomfort due to heat, caused by lack of airflow.

Carbon's lattice innovation, unlike the insulating closed-cell approach, provides an open-lattice cell structure for improved airflow and breathability. Moreover, the company enhances comfort performance by providing a tunable load-compression profile.

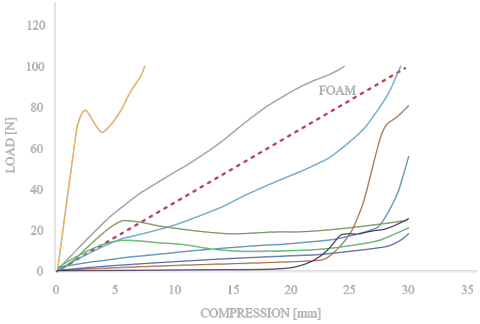

Figure 4: Nine Carbon example lattice structures (metamaterials) with unique load-compression behaviors compared to the linear load-compression profile for foam

This figure presents load-compression behaviors for nine different lattice structures and metamaterials from Carbon's library, highlighting a wide range of available lattice behaviors.

With these lattices, only a small set of availabilities are possible. It is possible to tune these lattices for the desired comfort profile, in order to get specific outcomes in mechanical and thermal characteristics.

After tuning these lattices, the latter outperform closed-cell elastomeric foam, delivering a wider stress-strain "band" within the flat plateau region, and superior performance on compression response and control (see Figures 3 and 4).

In addition, *"this solution provides the capability for digital control throughout the load-compression curve, making it possible to precisely define the transition points between linear elasticity, the plateau, and densification."*

However, it must be said that elastomeric foams do not allow for tunability and controllability, resulting in product development teams wasting cycles on trial and error, and optimization processes for every new application.

Lattices can then displace foam in applications such as headsets, seats, headphones, or orthopedic pads.

SAFETY

Using conventional techniques, safety products require costly assembly of multiple foam parts to create varying functional performance zones within a single product.

The lattice solution proposed by Carbon enables designers to 3D manufacture a single monolithic part produced from the same material with a design that delivers multiple functional performance zones.

With this approach, industries can manufacture products with improved safety performance.

Designers are now exploring the applications in sporting equipment (Figure 6).

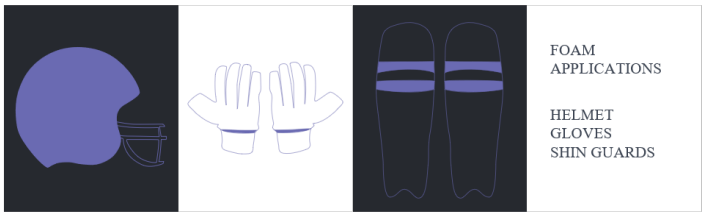

Figure 6:Example applications that could benefit from improved and tunable impact absorption offered by Carbon lattices

PERFORMANCE

Foam's ability to meet performance specifications makes it a natural fit for sports applications, such as football protection pads and shoe midsoles, for which it helps with cushioning and energy return. The most common foam used in sneaker midsoles is a closed-cell foam called EVA (ethylene vinyl acetate).

The story says that a single EVA foam structure has been used to make the entire midsole. **Saucony was the first athletic shoe company to create a dual density-molded midsole** by combining different foams for areas of stability and cushioning, creating a de facto industry standard.

However, adidas and Carbon set the bar high with the launch of the Futurecraft 4D shoe.

Today, it is possible to 3D manufacture several unique functional zones within the same monolithic part and tune the mechanical properties within each of these functional zones separately.

Concrete fact: adidas had been looking for a platform that would enable the company to tune cushioning properties throughout the shoe, and ultimately mass-manufacture a bespoke line of athletic footwear. The company aimed at creating a pair of shoes that would free them from the limitations of conventional footwear manufacturing.

Both companies, Carbon and adidas reached a new level in footwear manufacturing with the launch of **Futurecraft 4D**. The shoe delivers precisely tuned functional zones within the midsole. The midsoles have different lattice structures in the heel and forefoot, to account for different cushioning needs for these parts of the foot while running.

Carbon's technology addressed adidas' complex requirements in a single high-performance monolithic midsole therefore placing foam as the primary performance platform for athletic needs.

adidas Futurecraft 4D shoe

An adidas Futurecraft 4D midsole printed on a Carbon printer, demonstrating varying lattice structures along the midsole

LASTLY...

With this case study, Carbon demonstrates how product development teams can go beyond the barriers of properties of foam to have access to new materials, design freedom, and manufacturing capabilities, making it possible to rethink old benchmarks of **comfort, safety, and performance.**

Applications such as bike seats, shoe midsoles, car seats, helmets, orthopedic pads, and headsets serve as starting points to include 3D printing technology in the manufacturing process.

To learn more about Carbon's lattice solution or discover how the lattice library of metamaterials could help you to make differentiated products, send an email at **sales@carbon3d.com.**

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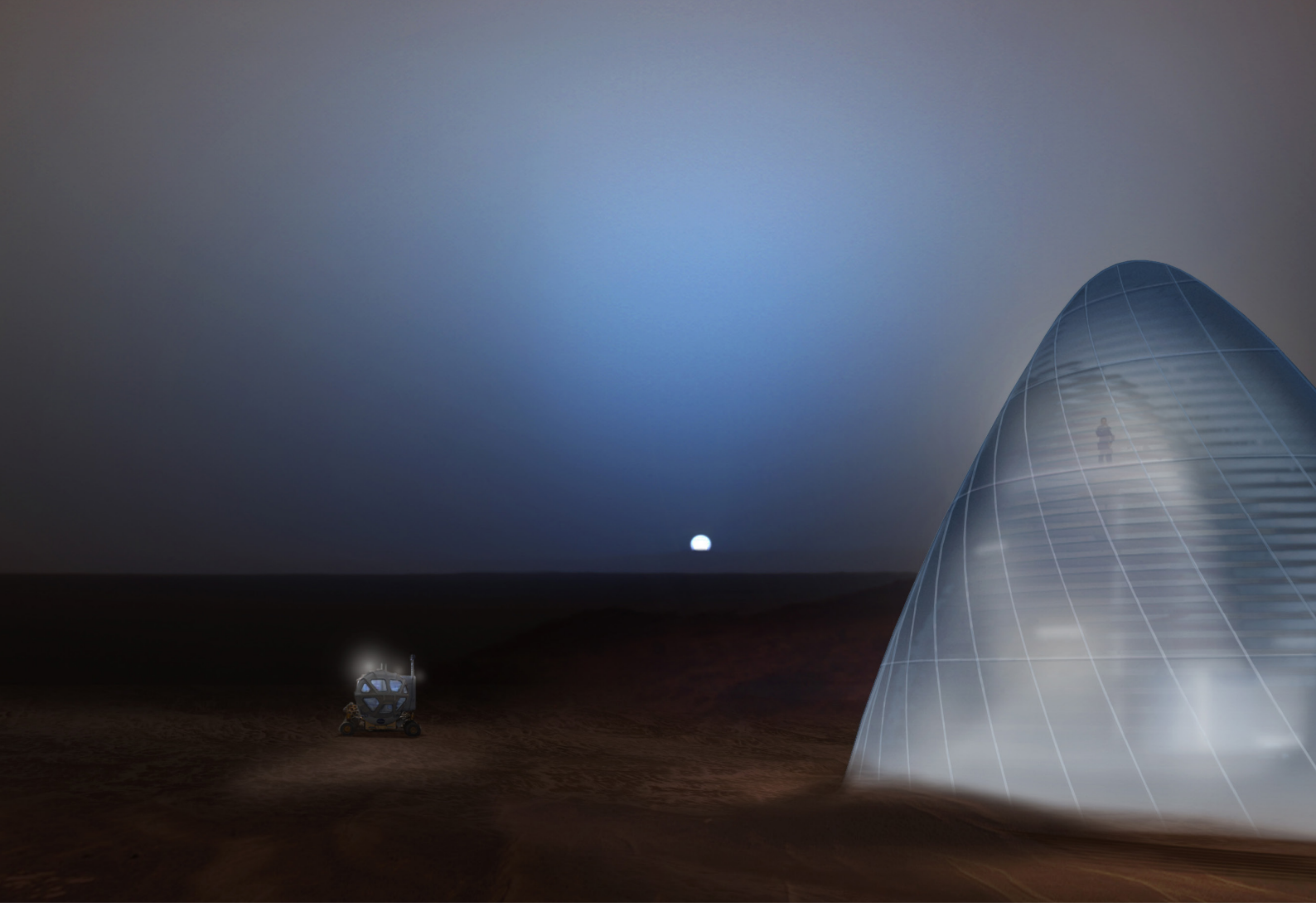


NASA kicks off $2M 3D Printed Habitat Challenge Phase 3: On-Site Habitat Competition

NASA and its partner Bradley University of Peoria Open $2 Million Third Phase of 3D-Printed Habitat Competition

In September 2015, NASA launched a multi-phase challenge to build a 3D printed habitat; the main purpose being to encourage the development of new technologies required to additively manufacture a habitat using local indigenous materials with, or without, recyclable materials.

NASA's 3D-Printed Habitat Challenge, a Centennial Challenges competition, seeks ways to create or develop the technologies needed to create such habitats on-site, and challenges citizen inventors to lead the way.

During the **first phase**, participants developed state-of-the-art architectural concepts. It was completed in 2015. The purpose of this stage was to make the construction technology progress in order to create sustainable housing solutions for Earth and beyond.

For **Phase 2**, the challenge laid emphasis on manufacturing structural components and was done in August 2017.

And now **Phase 3** includes five stages: "On-Site Habitat Competition challenges competitors to fabricate sub-scale habitats using indigenous materials with or without mission-generated recyclables, and offers a $2 million total prize purse".

NASA'S 3D-PRINTED HABITAT CHALLENGE

A NASA CENTENNIAL CHALLENGE

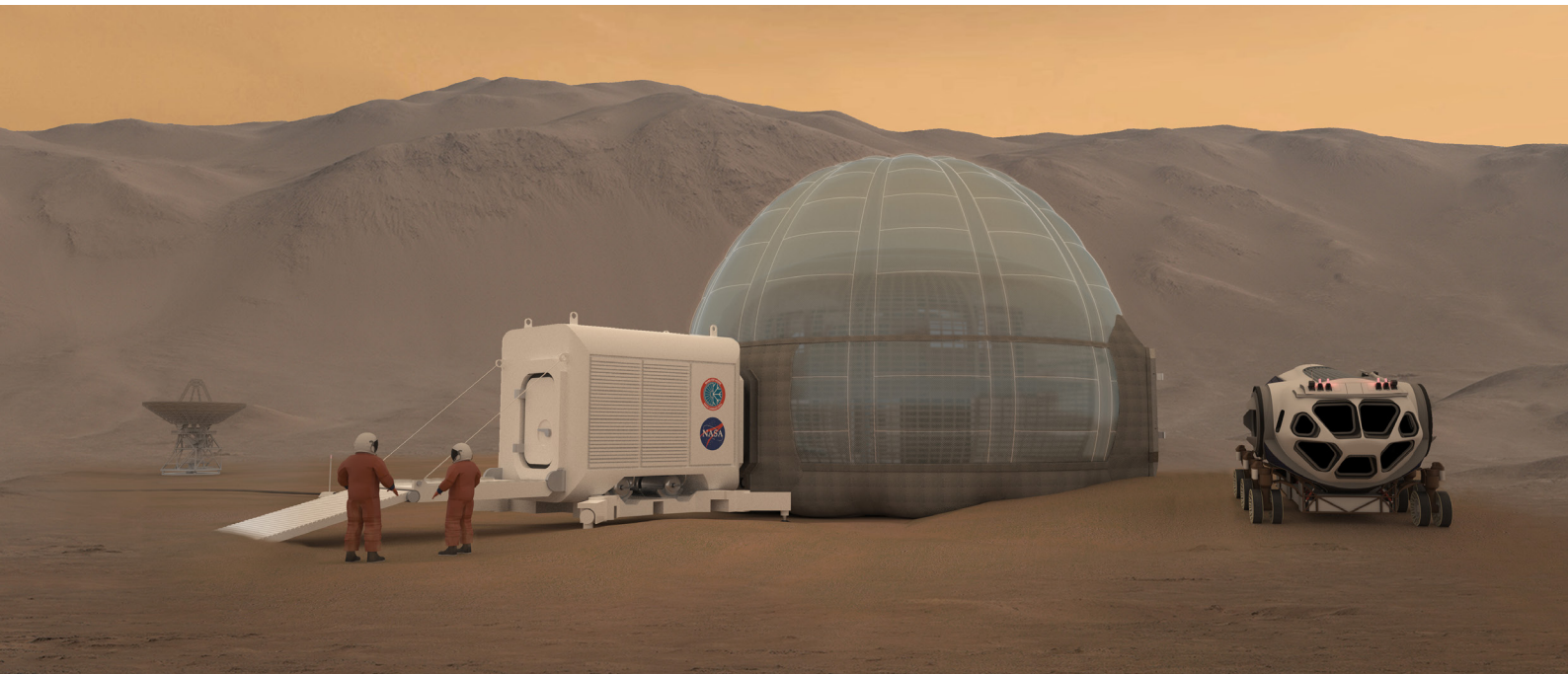
"The ideas and technologies this competition has already produced are encouraging, and we are excited to see what this next phase will bring," said **Monsi Roman**, program manager of NASA's Centennial Challenges. *"The solutions we seek from our competitions are revolutionary, which by nature makes them extremely difficult. But this only fuels our teams to work harder to innovate and solve."*

Bradley University President Gary Roberts said the school is honored to be the challenge partner once again.*"Bradley prides itself on experiential learning and student engagement,"* **Roberts** said. *"This challenge isn't something our students can learn about in a textbook or in a classroom. This is a forward-thinking concept coming to life, and they have a chance to see it firsthand. They will meet the people making it happen and learn about the ideas that are fueling innovation. This could change the way they imagine the future and push their creative limits."*

Interested teams may register through Feb. 15, 2018. Full details, schedule and rules are available on the **website of Bradley University.**

Bradley University partnered with sponsors Caterpillar Inc., Bechtel and Brick & Mortar Ventures to run the competition.

For more information about the program, visit: **http://www.nasa.gov/winit**



Does the future of car production lie in additive manufacturing?

Metallic 3D printing systems have already begun to create a world of new possibilities in the areas of development, design and production. The technology is now finding a home in exclusive mass production as well.

Jörg Spindler, the Head of Equipment and Metal Forming at the Audi Competence Center, answers this question by trying to calm the euphoria. To do so, he makes a comparison with carbon components: “Carbon-fiber-reinforced polymer didn’t knock steel sheets out of the game. Rather, it created new possibilities. Metallic 3D printing is also not a competing process in mass production. But it will certainly lead to significant progress in some sub-areas.”

The technology has already revolutionized production of prototypes, creating a component directly from the design drawing. Knuth Walczak, the Head of Innovation and Advance Development Management in the E. Department at Porsche, says of the technology: “3D printing is already saving tremendous amounts of time in terms of the very small lot sizes used in development and auto racing. Other strengths of the process include reducing weight and helping in areas where a component will take on additional jobs like cooling or air flow.”

Jörg Spindler, the Head of Equipment and Metal Forming at Audi Competence Center: « The new technologiy will not replace conventional processes. But it will create new, fascinating possibilities»

As a result, tools used for hot forming, plastics injection molding or die-casting applications with conformal cooling channels under the surface whose improved cooling leads to reduced process times can be produced. The example also shows that 3D printing faces no limits in terms of durability.

For Knuth Walczak, "No direct weakness is created in material properties. Even highly stressed parts like pistons can be printed. Because the material is laid layer upon layer, you can systematically affect the microstructure. The mechanical properties differ significantly from those of conventionally produced parts."

Potential lies in the area of weight reduction

In work to reinforce an A-pillar, the number of individual parts and, as a result of the bionically optimized design of the component, the weight could be reduced by 74 percent – while maintaining the same level of durability.

Despite these strengths, the use of metallic 3D printing will remain limited to special application areas for the time being because the process is relatively slow and expensive. Dimensional accuracy and finish quality need to be improved as well. In extreme cases, it can take more than 100 hours to print a prototype engine block. The rule of thumb for the technology is: smaller, more complex and less cost sensitive parts are better suited for 3D printing.

Special and exclusive series made by Volkswagen are well suited for the use of metallic, 3D-printed components. The first parts in these areas are now being produced by metallic 3D printing.

Original replacement parts that are rarely needed are also being reproduced today by 3D printers. Such parts include a gearstick for the legendary Porsche 959 or a water connector for Audi's W12 engine.

Like many new technologies, much work must still be done here before prototypical applications can make the leap to mass production used in the automotive industry. **Jörg Spindler** says: *"Today, 3D printing pays off when you make up to 200 units throughout the life cycle of a product. With the help of optimization in process and plant engineering, we will be able to reach cost effectiveness at a level of 3,000."* In turn, cost reduction would open new ways to customize vehicles, like special performance models in exclusive series.

***Alexander Schmid**, a member of After Sales and Sales at AUDI AG «**With fewer necessary original replacement parts, reproduction on demand could simplify logistics and warehousing operations and lower costs.**»*

Ingo Hartmann networks the 3D printing activities in the Group: «The group is filled with pioneering spirit. We are bringing the Group's TOGETHER strategy to file».

STRATASYS brings BioMimics

3D printed models of Human Anatomy to hospitals

Stratasys, the provider of additive manufacturing solutions recently introduced BioMimics, a solution capable to 3D print medical models that are designed to meet demands of hospitals, researchers and medical device manufacturers.

BioMimics represents 3D printed replicas of complex anatomical structures – allowing more effective medical training, education and advanced device testing. Indeed, the solution brings out the complexities of both soft tissue and hard bones via multi-material 3D printing.

The difference with traditional methods

The reality is that conventional methods involve the use of research and testing on animal, mannequin, or cadaver models whereas BioMimics truly portrays every part of soft tissue and hard bones via multi-material 3D printing.

However, with the use of Stratasys' PolyJet 3D printing technology alongside new materials and software, hospitals and researchers can create specific 3D printed models that best meet the expectations of professionals during live medical scenarios. In addition, they can get real-time feedback on device performance from OEMs.

Simply put, doctors will be able to test innovative medical devices, to teach principles of surgery, to provide continuing medical education and even demonstrate new products to clinicians.

Leveraging BioMimics, surgical trainees practice on 3D printed heart with congenital defect.

"Much like simulation and co-piloting builds expertise for pilots, medical practitioners hone skills throughout their careers to provide exceptional care," said **Scott Rader**, GM of Healthcare Solutions at Stratasys. *"The challenges of today's solutions include animal models that only approximate human anatomy, and cadavers that don't retain the live-tissue feel and often lack targeted pathology."*

It must be said that BioMimics is only available in North America for now.

Multi-material 3D printing empowers surgeons to better train and test new devices on models prior to neurosurgery.

The point of view of professionals

According to Dr. Adnan Siddiqui, Chief Medical Officer at Jacobs Institute, Vice-Chairman and Professor of Neurosurgery at University of Buffalo Neurosurgery, thanks to this solution, experts have reached a level of clinical sophistication nobody has ever known in the world of vascular models. He really thinks the solution will improve medical innovation in vascular disease through better *"pre-clinical validation of new devices and clinically realistic training simulators."*

"As [a] research and pediatric hospital in Canada, SickKids is committed to unprecedented innovation to positively impact the well-being of children around the world. We have developed new training programs through 3D printing that allow surgeons to practice procedures on replicas of real patient's pathology," said **Shi-Joon Yoo**, MD, PhD, Cardiac Radiologist at the Hospital for Sick Children and Professor of Medical Imaging and Pediatrics at University of Toronto.

"BioMimics enhances the realism and clinical validity of the models even further – allowing the surgeons to develop the techniques and skills that will translate into live patient cases."

As for Stratasys…

This is not the only involvement of the company in the medical industry. The provider of 3D printing solutions recently signed a commercial agreement with Philips which consists in advancing the impact and use of 3D printing in medical modeling.

The agreement includes virtually seamless interfacing and dedicated workflows across Philips IntelliSpace Portal 10 and Stratasys Direct Manufacturing's parts-on-demand service – allowing a broader range of medical professionals to improve training, research and surgical planning through 3D printing.

According to Greg Reynolds, VP of Additive Manufacturing at Stratasys Direct Manufacturing, this interfacing with Philips IntelliSpace Portal 10 aims at making it faster for doctors and their patients to receive customized, pre-surgical models.

Besides companies specialized in the 3D printing industry, the medical industry is increasingly becoming aware of the potential of 3D printing for patient care.

3D printed medical model mitigates risk, enabling physicians to see hidden critical structures

How Debbie Hawkins received a 3D printed left jaw...

A surgical team created a technique to reconstruct jaws affected by cancer using 3D printing…A premiere in the history of medicine

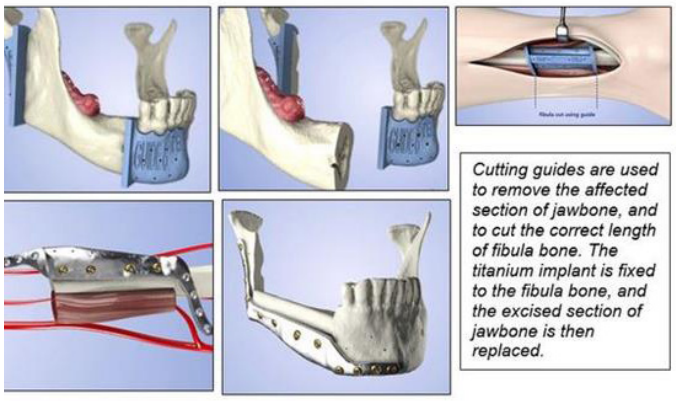
Debbie Hawkins, retail worker, and former patient from Morriston Hospital in Wales received a 3D printed jaw.

It all began when she started to develop a growing tumour in her lower jawbone which was about to break her jawbone.

After several consultations, doctors from **Morriston Hospital** realized none of their traditional methods could have repaired her jaw.

The needed of a more innovative method

First of all, the conventional procedure consists in taking bone from the patient's fibula (thigh bone). Thereafter, in order to keep the aesthetic shape of the jaw, the bone



Cutting guides are used to remove the affected section of jawbone, and to cut the correct length of fibula bone. The titanium implant is fixed to the fibula bone, and the excised section of jawbone is then replaced.

graft must be placed lower than the jawbone used to be, too low for dental implants.

Furthermore, to enable dental implants to be well aligned with the jawline, specialists needed to set the bone graft higher than the natural position of the jaw. However, the natural shape would be wasted.

Last, the remaining solution to fix her jaw was too risky since it made accuracy during the operation very difficult.

That's why, a 3D scanning was first necessary to have a detailed overview of the situation and how the operation should be carried out. Doctors then combined bone grafts and 3D printed titanium plates customized to fit the patient's anatomy.

"When they told me what the procedure involved I was scared at first," **Hawkins** told the press. *"I really didn't know what to expect. But what they have done, and the aftercare I have received, has been absolutely amazing."*

Peter Llewelyn Evans, Maxillofacial Laboratory Services manager at Morriston Hospital, said "the titanium implant fits the patient's jaw perfectly without the surgeon having to do any adjustment."

As for the patient's consultant surgeon Madhav Kittur, he noticed that this approach "has taken away the uncertainty"; *"we know exactly what is going to happen before we go into theater as everything is computer planned."*

A 3D printed suicide capsule, original or scaring?

Nicknamed « Dr Death », Euthanasia advocate Dr Philip Nitschke, recently created a suicide machine with a 3D printer.

Developed in The Netherlands, where the euthanasia campaigner lives, the Sarco machine is a sleek capsule with a touch pad inside.

3D printing is not the only thing which is quite advanced in the Netherlands. Doctor-assisted euthanasia is also legal in the country, even for children. Two arguments among many others that probably fostered the creation of the suicide capsule.

The manufacturing

"Dr. Death" invented the suicide capsule with engineer Alexander Bannink. As its name implies, it enables its user to commit suicide easily, painlessly and at the touch of a button.

Both partners made use of moulded plastic panels that could easily be 3D printed. The machine incorporates a reclining couch inside as well as a smooth canopy. Before using the machine, the user must pre-load the machine with four litres of liquid nitrogen. Through its integrated four-digit code, the patient can release liquid nitrogen.

The idea behind the use of 3D printing is to make the 3D printing files open-source for free, so that anyone who has a death wish and who can get access to a 3D printer can download the digital design for his own suicide capsule.

According to Dr. Nitschke, «the limit will be the availability of the new 3D printers.» His team is "looking at printing (it) using biodegradable wood and plastic. Printing materials are readily available as is liquid nitrogen."

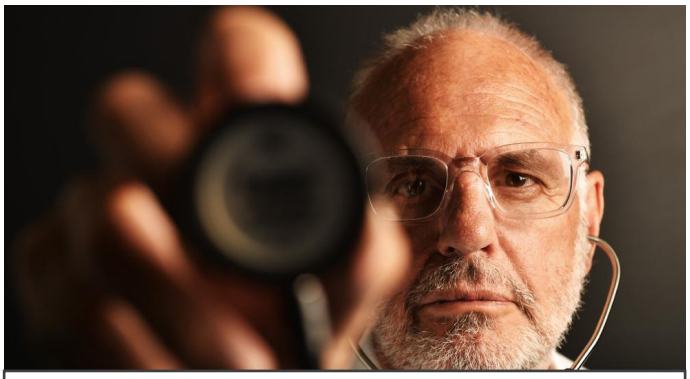
Practical use of the Sarco machine

In order to provide heart-rate information to those who are waiting outside for the end of the action, the user is required to wear a cardiac-trace wristband. This might enable a certain transparency of the canopy on the one hand; on the other hand, it will enable the user to decide whether he wants to be visible inside or not during the operation.

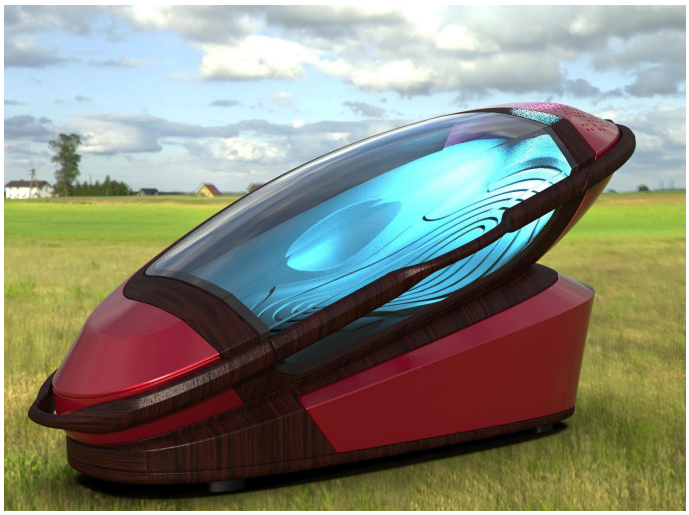
Experts said that once the four-digit code is activated, the patient is asked one last time if he/she wishes to dies.

"If Yes is selected, the mechanism immediately allows the liquid nitrogen (to flow)," they say. *"Within a minute, oxygen levels drop to a point where there is an inevitable loss of consciousness, followed by a peaceful hypoxia death. Following death, as confirmed by the ¬cardiac monitor, the capsule can be detached from the base and moved to the mortuary. If ¬desired, the capsule can be used as a coffin."*

The creation of this machine does not only raise moral issues or protection of human life in society. It also puts on the agenda regulatory issues concerning the use of 3D printing technology, a subject discussed this month by the European Parliament to better control the use of 3D printing technology but above all to promote purposes that serve and protect the interests of society.



Dr Philip Nitschke AKA « ***Dr Death***»



Formlabs Color Kit improves SLA Printing

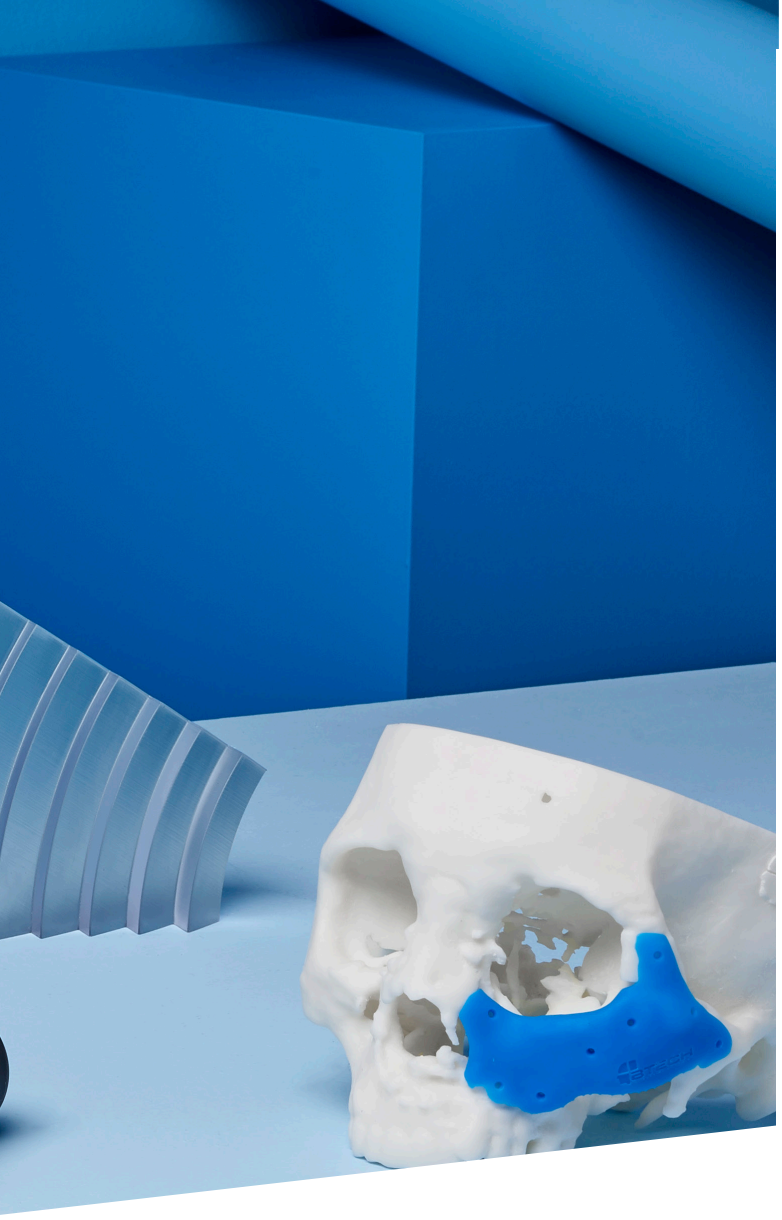
Formlabs recently announced the availability of its Color Kit. Users will now be able to print in color with FDM flexibility while discovering the boundaries of what's possible with desktop SLA.

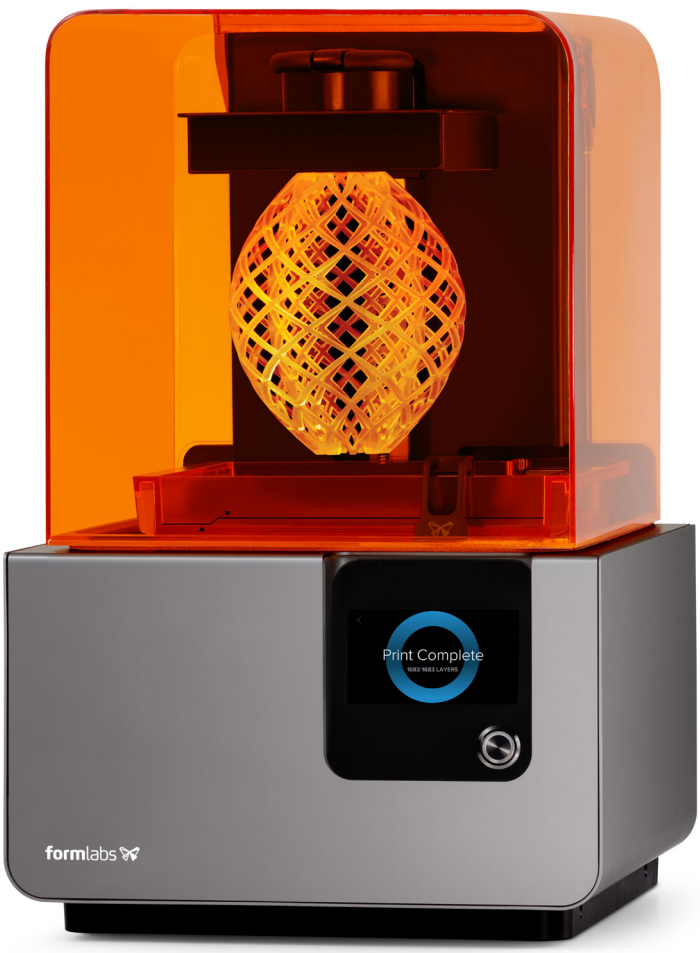
Indeed, Color Kit is an integrated color mixing solution for SLA that enables Formlabs' users to personalize their creations using a variety of colors and shades without requiring the manual work of painting.

The solution offers 16 color recipes or the ability to mix any color using Formlabs' Color Picker tool.

Once their own Color Resin is created, customers can 3D print parts on Form 2 3D printer and field test product concepts in shades that fit their environment and align with their brand identity.

"For looks-like prototypes, concept models, and others parts where aesthetic is top priority, Color Kit enables product designers, engineers, and other professionals to print many models in one consistent color, right off the printer, without the additional work of finishing and painting", **Marcelo Coelho**, head of design at Formlabs said.





Form 2 3D printer

Formlabs' SLA printing

As a reminder, SLA is an additive manufacturing technique that makes use of UV-sensitive liquid resins. Through a process called photopolymerization, SLA converts liquid materials into solid parts, layer by layer.

Some people prefer this process for its accuracy in printing small parts. Notice is to be made that the smaller the part is, the more each detail counts.

For Formlabs, Color Kit is an important step to improve the user experience, especially given that the Form 2 is the flagship product of the manufacturer.

Each Color Kit includes: a Color Base cartridge, five bottles of Color Pigment in Cyan, Magenta, Yellow, Black, and White, syringes for easy measurement, and a Recipe Book. The pigments are mixed into the base material to create a full cartridge of Color Resin.

HP further accelerates industrial 3D printing with New Jet Fusion 3D 4210 Printing Solution

Intended for industrial-scale additive manufacturing environments, the new solution reduces operating costs while boosting production volume capabilities.

HP recently expanded its additive manufacturing portfolio with HP Jet Fusion 3D 4210 Printing Solution.

Technically speaking, the hardware and firmware upgrades of the new printing solution enable a better system efficiency and continuous operation. Industrials for instance, will now easily manage the higher material volumes.

Indeed, HP Jet Fusion 3D 4210 Printing Solution raises the "break-even point" for large-scale 3D manufacturing to up to 110,000 parts and enables the industry's lowest cost-per-part (CPP) - up to 65% less than other 3D printing methods.

Further details show that the solution's average printing cost-per-part is 65% lower versus the average cost of comparable fused deposition modelling (FDM) and selective laser sintering (SLS) printer solutions on market as of April, 2016 and is 50% lower versus the average cost of comparable SLS printer solutions.

According to Ramon Pastor, General Manager of Multi Jet Fusion for HP's 3D printing business, HP is taking a new direction on its 3D printing journey and the speed, quality, and scalability of this system are the key elements that will help the company to go further.

The HP Jet Fusion 3D 4210 Printing Solution will be commercially available in March 2018. However, we already know that customers who purchase the solution will also take advantage of shared service contracts and reduce pricing on HP's engineering-grade 3D printing materials and agents.

***Ramon Pastor**, General Manager of Multi Jet Fusion for HP's 3D printing business*

The Open 3D Material Platform: its New Members and Materials

After launching of HP Jet Fusion 3D 4210 Printing Solution, Hewlett-Packard also intends to develop its Open Materials Platform. The interesting part of this story is the entry of new partners: Dressler Group and Lubrizol.

Dressler Group and Lubrizol: the deal with HP

Dressler Group is specialist in grinding and refining chemo-technical products. It will be supplying HP's materials partners exclusive access to its toll grinding manufacturing capabilities, the aim being to drastically reduce obstacles to 3D materials development.

As for Lubrizol, which is a Berkshire Hathaway company, it is specialized in chemicals production and possesses one of the largest portfolios of TPU (thermoplastic polyurethane). Its role here is to take part in the development of materials for final part production with HP Jet Fusion 3D systems.

Both partners are obviously quite thrilled to help HP in its Open Materials Platform.

"We see our contribution to the HP ecosystem as enabling 3D materials development that is incredibly precise and cost-effective, or as we call it, 'on the dot'", declares Jan Dressler, managing partner at the Dressler Group.

"Having access to HP's industry-first 3D Open Materials and Applications Lab and its wealth of cutting-edge tools, while collaborating directly with our customers, will help secure our place at the forefront of materials innovation and development into the future, while advancing the development of our Estane® Engineered Polymers product line", affirms Rick Tolin, President of Lubrizol Advanced Materials.

The forthcoming 3D printing materials

As far as the new 3D printing materials are concerned, HP unveils HP 3D High Reusability PA 11 and HP 3D High Reusability PA 12 Glass Beads, and very soon HP 3D High Reusability Polypropylene will be available.

The first material is used to produce low-cost, functional parts with impact resistance and an adaptation capacity for prostheses, insoles, sporting goods, snap fits, or living hinges.

The HP 3D High Reusability PA 12 Glass Beads produces parts with dimensional stability and repeatability which require hard rigidity. Housings, molds, and tooling are some examples of things that one can manufacture using this material.

As for the last material, the HP 3D High Reusability Polypropylene, it is a durable low-cost material. Parts produced with it present a good chemical resistant, lightweight, and watertight capabilities.

HP Jet Fusion 3D 4200

PA6-12T, first result of Prodways and A. Schulman's partnership

The material PA6-12T stands as the first major milestone of Prodways and A. Schulman's partnership to further accelerate 3D printing

A year ago, Prodways and A. Schulman decided to join forces…

In November 2016 at Formnext, Prodways, French company subsidiary of **Groupe Gorgé** and A. Schulman announced their partnership to strengthen Prodways' laser sintering powder range. Both companies decided to combine their R&D efforts on plastic powders, 3D printers and processes in order to achieve a greater and rapid development of new industrial applications.

As a reminder, **Prodways** proposes industrial plastic 3D printers with an open materials platform to a variety of industrial and technical applications.

As for **A. Schulman**, it is a supplier of plastic compounds and composites, used as raw materials in a wide range of sectors. It is important to note that the main product lines of the Ohio-based company include proprietary and tailor-made, engineered plastic compounds, color concentrates and additives; all of them aiming at enhancing the performance and appearance of plastics in specific fields.

November 2017: the birth of PA6-12T

PA6-12T is a plastic material for 3D printing using selective laser sintering. According to experts, the launch of this new glass filled material leads to new ideas for the 3D printing of high performance plastic parts.

We are precisely talking about parts made of injected plastic or metal, for the aviation, automotive and rail industries. Those parts need a certain rigidity, impact resistance as well as capacity to withstand high temperatures.

The material is characterized by its low sensitivity to moisture absorption, enabling it to maintain its mechanical properties in humid conditions. With the new PA612-GB 3800 powder, industries can 3D print plastic parts with strong mechanical properties and complex geometrical structures including fuel circuits or pump bodies. Such structures are difficult, or impossible to produce with conventional injection techniques.

A material that could replace machined metal?

The truth is that the laser sintering market is dominated by materials intended for fast prototyping.

If preferences vary from one work to another, and even from one professional to another, it must be said that powder PA612-GB 3800 could replace machined metal if professionals printed lighter and plastic parts with an optimized design (such as casings, the top parts of motors or ballast systems).

PA6-12T enables then the increasing use of 3D printing for small and medium final parts.

Finally, this is probably the first among the numerous innovations that will result from Prodways and A. chulman's partnership.

ProX® SLS 6100, the new SLS production system of 3D Systems for Functional Prototyping and Production-Grade Quality Parts

ProX® SLS 6100 is the new machine of 3D Systems' line of Selective Laser Sintering (SLS) production systems. With this new printing platform, customers can seamlessly scale from functional prototyping to low volume functional production parts.

The needs of a wide range of industries addressed

This new package that includes the printer, new materials, software and cloud-based services meet the requirements of the Automotive, Durable Goods, and Healthcare industries as well as specific needs for Aerospace interior cabin parts in terms of plastic prototyping and production.

Indeed, the ProX® SLS 6100 provides parts larger than small-frame systems, the industry's highest total cost of operation (TCO), according to the company.

Furthermore, 3D Systems affirms that its price would be surprisingly affordable compared to other 3D printers of its range.

Materials included in the package

The launch of the ProX® SLS 6100 is accompanied by the introduction of three nylon materials: DuraForm® ProX® FR1200, DuraForm® ProX® EX BLK and DuraForm® ProX® AF+.

The first material of this list meets FAR 25.853 requirements. In other terms, the flame retardancy thresholds required by the Aerospace market for interior cabin parts are respected.

With its high-durability, DuraForm® ProX® EX BLK is a nylon 11-based plastic that is manufactured from renewable non-petrochemical based resources. It provides functional production parts with impact strength and good fatigue-resistance for long-term usage. In addition, its black color removes the need for painting. It is recommended for short production parts such as vehicle dashboards, grills or even bumpers.

The last one is an aluminum- and mineral-filled nylon 12. It would be appropriate for the production of high stiffness components since they need heat resistance while under load. Casings, covers, housings for motors, small engines or parts requiring an aluminum aesthetic are some examples of elements that can be manufactured using this material. It delivers parts with smooth surface finish. However, its usage is interesting for prototyping of buttons and knobs where a metal-like finish might be needed.

With regard to this entire package which surrounds the launch of the ProX® SLS 6100, Vyomesh Joshi, CEO of 3D Systems, declares: "by combining production-grade nylon materials, an advanced software workflow and new SLS technology, the ProX SLS 6100 forms a versatile solution for functional prototyping and direct 3D production."

Anyway, this end of year has been marked by a series of revelations regarding new services and products from the specialist of 3D printing services. Indeed, the company renewed its service capability through a range of new offerings: the FabPro™ 1000, a 3D printer designed for engineers, designers, but also jewelry artisans and fabricators, will shed new light on the industry. Figure 4™, the fully-integrated direct 3D production platform and the DMP 8500 Factory Solution, its additive metal platform.

Aria, the new member of EnvisionTEC's desktop family

EnvisionTEC marks the end of this year with a new entry-level desktop 3D printer: Aria. Manufactured in the United States, on the company's acknowledged micro platform for professional 3D printer users, Aria delivers surface finish and accuracy.

What specificities will draw the expert's attention?

Professionals will find it interesting that Aria incorporates an industrial-grade **UV LED light engine**, a **dual-axis Z slide** and a material tray built with optical glass instead of plastic. Z layer resolution can be set at 25, 35 or 50 microns, depending on material.

Furthermore, Aria is equipped with the manufacturer's **Perfactory Software Suite** and **Magics** that offer patented grayscaling and exposure strategy methods for quality performance.

In addition to its touchscreen operation, according to the manufacturer, it is easy to swap materials with no waste.

Which material for which use?

First of all, Aria is ideal for desktop makers of jewelry, consumer goods such as toys and miniatures as well as industrial parts.

As far as materials are concerned, the desktop 3D printer could be used with four materials:

EC500. It is a lost wax casting material. With a melting point of 350 degrees C, it does not produce any ashes during the work. Professionals can use the material EC500 for considerable jewelry pieces, up to 20 grams finish weight.

Very popular, PIC100 is a low-wax casting material which produces castable parts with great surface finish and completions such as thin walls and intricate details. Unlike the EC500, the PIC100 is recommended for pieces up to 5 grams finish weight, such as bridal jewelry.

QView follows thereafter. According to the manufacturer, the average print speed at 100-micron layer thickness would be one inch per hour, in other terms 2.54 cm per hour. Those who make silicone molds will be interested in this material.

The last one which is offered in the package is RC90, a heat-resistant material that contains ceramic for building solid and resilient parts. Its use would be appropriate in the technology, entertainment or the jewelry industries.

With regards to the launch of this new 3D printer in Envision Tec's desktop family, **Al Siblani**, CEO affirms that they *"remain faithful to [their] mission of delivering a premium product, but at a more accessible price that gives users a taste of EnvisionTEC's outstanding quality."*

2017, a year that bears the hallmark of EnvisionTEC's fifteenth anniversary

The global provider of 3D printing solutions has made it clear throughout 2017: 15 years after the creation of the company, they have improved.

With regard to the numerous partnerships, the variety of products for different industries, the accessibility of these products around the world, we could agree with the fact that the company indeed sets the bar high.

But now, here comes 2018. What can we now expect from EnvisionTEC?

***Al Siblani**, CEO of EnvisionTEC*

Konrad Głowacki: Co-founder of Sinterit

interview

Sinterit, manufacturer of SLS 3D printers, enters the market with Sinterit Lisa.
Recognized for its "affordable" price, the printer firstly attracts by its design. With a deep experience in Business Development and Marketing, Konrad Głowacki, Co-founder of Sinterit is a software engineer by training. Beyond the attractive design of their flagship product, he explains what gave life to Sinterit.

> *Our primary goal is to make our customers faster and more innovative, thus helping them to get more customers and better products.*

How did you come to the creation of Sinterit?

My interest in 3D printing started several years ago. I built my own RepRap machine, a Prusa hybrid … and I realized that there is a lot of potential in this industry on the one hand, on the other hand, that there are a lot of limitations of FDM technology. That's why our current CEO, Paweł Szczurek and I started thinking about what we could do ourselves and we realized that there are SLA and SLS printers that are extremely expensive but do not have a lot of limitations …

The first idea was not to create a company, it was more about software and making a good device… A few moments later, we used the knowledge acquired in SLS to provide an appropriate service to consumers. The main idea was to change the "pricing point" and to push forward SLS technology as well as FDM. After the promising results of the tests obtained in September 2013, we increased the number of prototypes in 2014 and when Michał Grzymała-Moszczyński, our third Co-founder, joined us, Sinterit really took off.

What makes your flagship product Sinterit Lisa different from other 3D printers?

This is the first SLS machine globally available. The biggest advantage is that the customer can achieve better results on prints quality and gets very good accuracy compared to other SLS machines, and other technologies. So, when you compare the quality/price ratio, Sinterit is the best 3D Printer one can find on the market.

Furthermore, the user can have a user-friendly experience on the product. Compared to other printers, Sinterit Lisa's layer system integrates a loading system that makes it resistant to any kind of shipment.

Who is your primary target?

The primary market includes small and medium-sized manufacturing and design companies. Indeed, they need to get better and faster prototypes, and to be able to achieve small scale production with good materials.

Also, there is a lot of interest from research and educational institutions, as well as big companies. SLS is interesting for industries such as automotive, aerospace etc….

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Our primary goal is to make our customers faster and more innovative, thus helping them to get more customers and better products.

What is the market with the greatest demand?

Currently, the European market: France, Germany…which are also the main drivers of this technology.

We see a potential and interest in other continents but currently Europe presents the highest demand.

You support a great number of clients in their projects, tell us about 2 of them which were really challenging for the company.

Every customer is challenging for the company.

One challenge was to manufacture an exoskeleton arm. Made in collaboration with the 3D designer Bartłomiej Gaczorek, the exoskeleton arm enables a kid who suffered from SMA (Spinal Muscular Atrophy), a neuromuscular disease that affects nerves, to do the things he loves the most: move his hands, draw or simply play.

Another project was realized in collaboration with Professor Rigo Herold from Germany. We manufactured AR glasses. The issue is that the standard size of the eyepiece does not always work in the industry. The requirements were high – the rims had to be lightweight but quite precise, to be able to set all the necessary elements in. Resistance to high temperatures and durability, were also important factors, especially in the case of people exposed to harmful substances hence the use of 3D Printing, which happens to be the best solution. It is an example of customized production that happens to be sustainable. The testing on materials, the production needed to be customized… it was crucially required.

What triggers the launch of the 3D print design competition organized with My Mini Factory?

We made SLS technology available so that designers can create high quality projects, but also to motivate them to develop innovations. This contest was to show how to upgrade big projects from FDM to SLS technology, to use the potential of SLS technology, to show that there are no limitations on the form.

What do you think about the 3D printing market?

I don't think it is already a mature market. It is still growing. The most challenging part is to find the proper technology for the proper application. To make this technology accessible to a worldwide audience is quite hard. And it's hard to focus on that.

Its growth is seen by all of us. Time and interest from companies are increasing as well. It will still take some time for the market to be mature, maybe 5 years… I can see that there are a lot of innovations that will happen soon…

What about Poland?

It is a market where we sell many 3D printers … certainly much less developed than Germany. Much more work remains to be done, but people understand the possibilities of 3D printing better. We also have a lot of 3D printers' manufacturers, which shows that we are innovating a lot in the industry. What is interesting to note is "the kind of support that exists between us in the marketplace. "

What are Sinterit's prospects of development?

For now, the most important part concerns the different fields of application of the technology. This involves new materials as well as the vision of new customers … and it is very promising for the future. As for next year, new things are being prepared…#Staytuned

SINTERIT

For further information about « Sinterit Lisa» visit:
https://www.sinterit.com/

The 3D Printer
DA VINCI 1.0 PRO 3 in 1
Tested for you!

As part of its series of tests, the engineering department of 3D Adept carried out the test of the da Vinci 1.0 Pro printer of the manufacturer XYZprinting. It is a 3D printer offering the most advanced features for the general public. It works with the fused filament system with printing dimensions of 20 x 20 x 20 cm.

Without further ado, 3D Adept's opinion …

Unpacking

Before removing the printer from its packaging, firstly read the installation and operation manual provided by the manufacturer XYZprinting. By taking into account the instructions, the machine (which weighs 26 kg) will be easily removed from the box without too much difficulties.

Once the printer is out of its package and installed on our workspace, we observe the da Vinci 1.0 Pro is a robust machine with a chassis showing a high rigidity.

It comes with a well-stocked accessory box, which guarantees both a fast and reliable use of the machine in the long run. A filament cartridge, a USB cable, a cartridge holder, a XYZprinting software CD, a nozzle cleaning wire pack, a spatula, two cleaning brushes (one of them is made of copper for the outside cleaning of the nozzle), 3 plate ribbons, two side plates serving as a lid and a power cord are also included. A user guide and a warranty card are used as documentation.

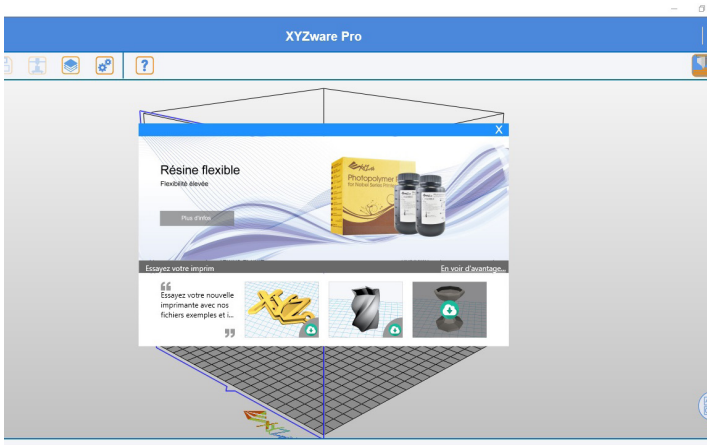
It is now time to read the installation guide before the said-test of the machine.

Installation

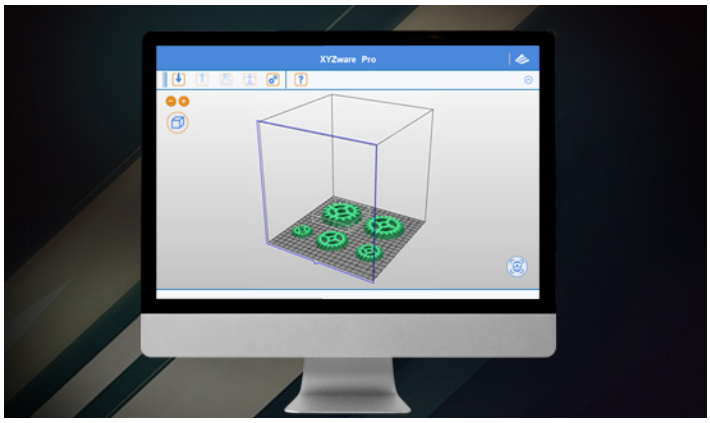
In fifteen minutes, the installation including the first calibrations is done. The printer is ready to operate under good conditions. 3 print test templates are available in the printer's memory card to give an initial overview of the print quality.

The user guide allows to carry out all the settings step by step, through detailed explanations associated with images. Some features such as the automatic calibration allow the user to save time, and thus to get a quick control of the machine.

Software



The da Vinci 1.0 Pro works with XYZware Pro, an easy-to-use and intuitive software. The CD supplied in the accessory box is intended to the installation of the software. The latter enables to transfer the print file from the computer to the printer. The connection between the computer and the printer can be done with a USB cable or through a WI-FI connection.

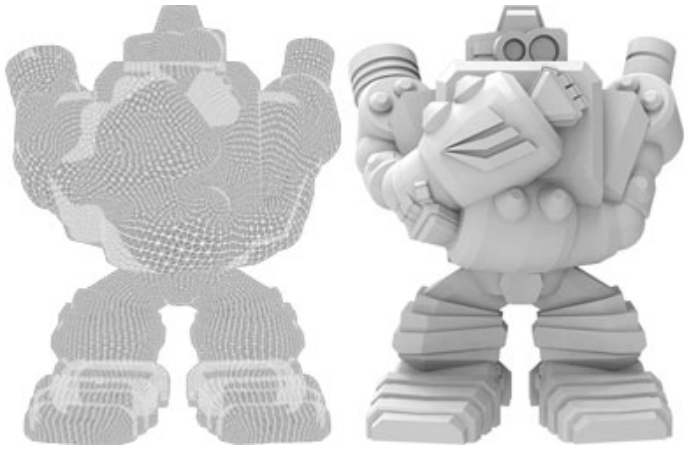


However, after the software's installation and before the transfer of print files, a set of updates is required. Be careful! These updates are often repetitive; therefore, they can be interpreted as errors.

Printing can be launched both from the computer and directly via the printer menu. The user can also take control of the printer via the application XYZapp (compatible with Android or the iOS system).

Printing

Once the machine is ready and calibrated, we firstly sticked a ribbon on the heating plate of the printer. Thereafter, we used one of the predefined models in the printer to launch our first printing.



The first observation that comes out is the speed: it does go fast! About twenty minutes for this first printing. Indeed, it is quite fast when we look at the quality after printing.

Another interesting point: this printer is less noisy compared to other printers of the same category. This sound aspect is one of the advantages of this printer which can be integrated into a collective workspace (design office, co-working space). The kit in the accessory box allows to externally and internally clean the nozzle after printing.

As far as compatibility is concerned, this printer is compatible with ABS and PLA filaments, with a diameter of 1.75 mm and automatic discharging/recharging. The use of third-party companies' filaments also offers the user many possibilities regarding his printings.

Compatible print files are 3w / stl files. The XYZware Pro automatically converts the user's file to 3w before printing.

The last word

Let us not beat about the bush, this da Vinci 1.0 Pro is a good printer, based on simple and intuitive use. Its robust and rigid construction is its first highlight. Its speed of printing and above all the quality of the printed parts meet the expected requirements. Thanks to its large print volume, it distinguishes itself from other printers of the same range.

The key point to improve is the repetitive display of numerous error messages. Although the correction solutions are integrated in the user's guide, it is always interesting to use a printer with as few errors as possible.

However, the test of the da Vinci 1.0 Pro remains positive. This printer will not disappoint neither the novice who is looking for a machine to start nor the professional who needs to quickly prototype his technical parts in ABS and PLA.

Summary

Strengths	Areas for Improvement
• Ease of use • Print quality • Fast printing • Compatibility with third-party companies' Filaments • Automatic Calibration • Heating plate • Automatic discharging and recharging • Print support via a Wi-Fi connection • Can print from the XYZapp mobile application • Engraving module • Detailed user guide for easy handling	• Repetitive error messages at the beginning • Repetitive updates

Last but not least, while taking into account the first printing, print quality, print speed, software and application, if we should assign an overall rating for this test, it would be **7.5 / 10**.

MakeX introduces Migo, €126.8 portable internet-enabled FDM 3D printer

MakeX, a China-based company returns to Kicksarter for its third campaign. The manufacturer is acknowledged for the good reputation of its products quality and reliability.

Migo enters the market in the desktop FDM 3D printers' family. It offers a range of interesting features such as portability and internet-connectivity but first draws the attention by its very affordable price.

Let's discover its features

MakeX introduces a 155 x 195 x 270 mm 3D printer. Built from a sturdy aluminum shell, the 3D printer is simple and offered in a range of nice colors. Even if the machine is small, it does not mean the build volume capacity has been sacrificed. Indeed, MakeX' new 3D printer has a build volume of 100 x 120 x 100 mm which is 28% of the printer's total footprint.

Furthermore, the standard printer incorporates a patented location system and high quality linear guidance which allow the user to get accurate, stable, and reliable printing. Thanks to the auto-leveling feature of the 3D printer, inconsistencies and deviations are corrected before the user starts printing.

As far as extrusion is concerned, “a nozzle diameter of 0.4 mm, and a layer resolution of 0.05 mm with industrial lead screw, ensure consistently high precision, smooth surfaces. We consolidated the extruder head’s power cord, signal cable, and other components into a single TYPE-C,” the company said. “This lets you plug-in and instantly print.”

From a software point of view, Migo offers internet connectivity (Ethernet, WiFi, and PC board based on ARM), real-time monitoring and a generative design application.

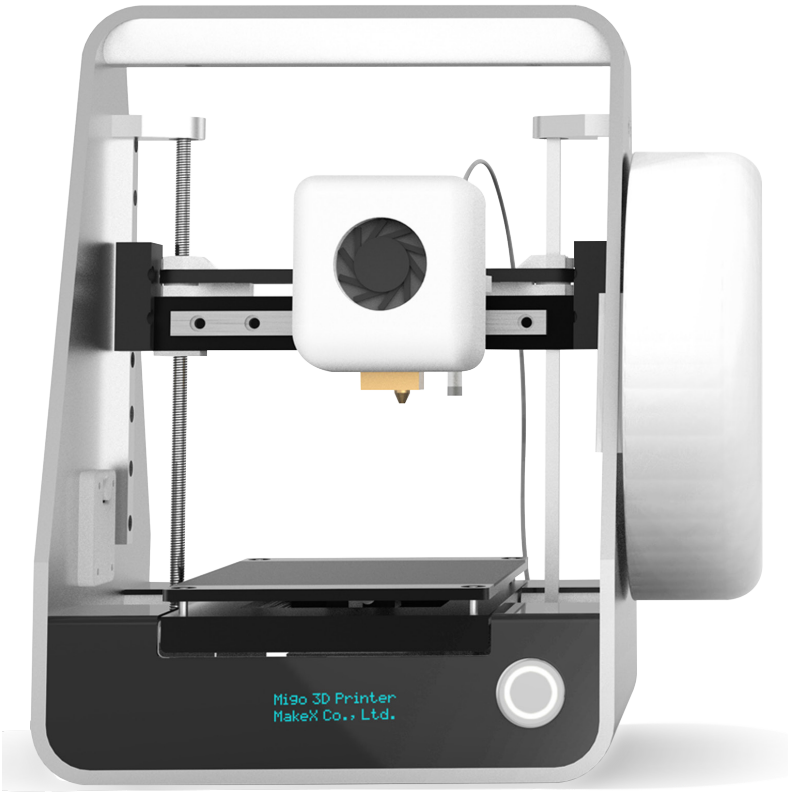
Another interesting feature is that it is possible to replace the print head with the 500 mw laser head. Materials such as wood, leather, plastic, food, and many more can be used with this laser component.

The funny part is that Migo only weighs 2.5 kg (5.5 lbs), which means that it is possible to launch the print job, pick up the machine and bring it anywhere without any inconvenience. The plus point of this package is that the company offers a backpack in which to carry the 3D printer, so users could easily print while they walk.

For those who will buy the 3D printer for educational purpose, MakeX included a teaching mode to facilitate the activities in class.

The Kickstarter campaign is almost done and MakeX has already raised more than $100,000, the expected funding target. However, interested buyers might still encourage and reach out to MakeX to get further information about the purchasing conditions.

Those who have already ordered a Migo 3D printer can expect to receive their rewards from July 2018.



The 3D Printed Self-Balancing Scooter, an attempt to “think additively”

In an assignment, students at University of Applied Sciences Ravensburg-Weingarten were asked to optimize the life cycle of a digital product for customized production. As a result, they achieved a self-balancing scooter development process around 3D printing technology

As part of a collaborative state university project supported by industry giants such as Porsche and Siemens, students from the University of Applied Sciences Ravensburg-Weingarten developed a first-of-its kind 3D printed self-balancing scooter using Stratasys’ 3D printing technology.

Called «Digital Product Life Cycle”, the project aimed at implementing a fully integrated and automated digital development process for the production of customized products.

In order to realize true customization, the students produced a first fully-functional prototype. The latter was achieved 85% quicker than conventional manufacturing methods.

A challenge to explore different technologies

The advantage of the approach used is that students had the possibility to weigh the pros and cons of each technology. It turned out that, from idea generation and

product design to the creation of complex prototypes for functional testing, 3D printing technology was essential at virtually every step of the project.

Traditional methods of manufacturing

Milling and molding are part of the conventional manufacturing processes that could be used. Notice is to be made that the scooter integrates several parts from motor to electrics which implies a specific approach to develop the scooter’s body frame. The production using these methods was then too complex and required too much time which they did not really have.

Dr.-Ing. Markus Till, Head of Department Mechanical Engineering at University of Ravensburg-Weingarten explained then: *“When creating a customized product, the bottleneck is usually manufacturing as tools, molds and specific fixtures need to be made – this takes a long time. With traditional methods, the manufacturing process would have taken us three weeks.”*

By using 3D printing, they took advantage of the freedom of design and discovered the numerous possibilities of customization.

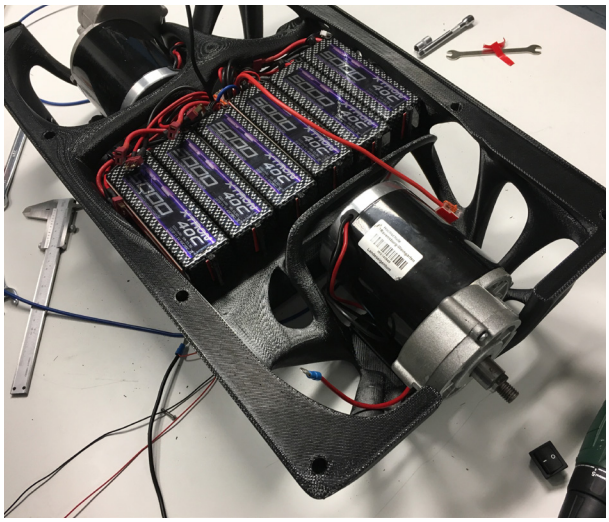
Materials and additive manufacturing technologies

In order to 3D print the frame and the platform parts, students made use of Stratasys Fortus 900mc Production 3D Printer. Using Nylon6 material, this 3D printer enabled them to 3D print in one piece.

Furthermore, they made use of Stratasys Connex3 Color Multi-material 3D Printer to 3D print in Agilus30 material the rubber-like cover which was incorporated on the platform for better grip.

This stage was quite important for the team since it almost changed their entire mindset when it came to product development. Moreover, they only needed 4 days to achieve it, a huge time-saving compared to the expected time using traditional manufacturing methods.

« Producing the core prototype parts for the self-balancing scooter was a real stumbling block until we discovered 3D printing," says **Dr.-Ing. Markus Till**. *"We realized that 3D printing offers the best possible manufacturing solution for an ideal executable product development method for a customized product. We designed the entire product development process around Stratasys' additive technologies, enabling us to quickly design and produce a fully-functional prototype of a geometry that was previously too complex to be created through any other traditional method – offering the first viable alternative for quick and cost-effective customized production."*



What's next?

Following the success of the scooter manufacturing, the university is more than aware of the importance of 3D printing technology in the different trainings of engineering students. The latter will now carry out a wide range of projects which will enable them to verify designs and validate concepts.

In addition, the University will further integrate 3D printing into courses, since global companies involved in the project mentioned the growing demand for graduates who have knowledge and expertise in this technology.

Last, *"the University of Applied Sciences Ravensburg-Weingarten is a prime example of how designers, engineers and manufacturers today are involving additive manufacturing from the outset of product design to be able to exploit its benefits throughout the entire development cycle."* **Andy Middleton**, President EMEA, Stratasys, concludes.

Plumen lights your home with 'Ruche', 3D printed lampshades

Plumen drew the attention of the public for the first time two years ago as part of a collaboration with Formaliz3d, an Italian 3D printing and design company, to realize the 3D printed Kayan lampshade for its ecological light bulbs.

The UK-based start-up believes that it is possible to encourage the adoption of ecological lighting technologies. And to achieve that, the solution is to create beautiful low energy light bulbs because if people appreciate the look, they will surely use it.

Today, the start-up collaborates with Hook Phanthasuporn, designer and engineer, to produce a series of 3D printed lampshades, called Ruche.

Ruche, a closer look at the manufacturing technique

Shapes found in the plant world inspired the modelling and the manufacturing of this collection of 3D printed lampshades. The modelling enabled to obtain a design that looks like something familiar that would have been impossible to create *"in any other way than through the 3D printing technique."*

Nik Roope, the Co-Founder and Creative Director of Plumen affirmed that traditional construction techniques constituted a brake to the creativity and realization of shapes. Available in a hundred of colors thanks to 3D printing, once the lampshade is placed around the light bulb, the bulb looks like the opening of a flower.

"Slips of light escape like rays of sun through trees, while the open base allows the brightness of the bulb to fully illuminate the surface below."

For those who are still looking for the perfect venue for their lampshade…

Your "Ruche" can suit in a bar, a hotel, a restaurant or even in a living room. In the end, it all depends on your creativity and your taste for decoration.

For further information about the collection, visit:

https://plumen.com/

GOLD 3D PRINTED PEN

Pjotr unveils solid gold 3D printed luxury fountain pen

Dutch designer Rein van der Mast, also known as Pjotr, has introduced his latest 3D printed luxury writing instrument: Spica Virginis. The new pen is made from solid 18K gold.
Rein Van der Mast revealed himself on the luxury market in 2013, when he reinvented the classic fountain pen using new technologies.

Over time, he demonstrated the possibilities of 3D printing and design with his first 3D printed fountain pen, a titanium version of the Spica Virginis 3D printed pen. Today, the designer takes a step further with the release of this luxurious product, 3D printed using an Ultimaker 3D printer.

To create the structure of his 3D printed pen, the Netherlands-based designer was inspired by wheat. The structure of the original titanium Spica Virginis was also inspired by wheat. According to Rein, the pen's name came from the brightest star in the Virgo constellation.

Available in both yellow gold and white gold, the 18K yellow gold color recalls the look of grain caught in the sun.

As far as materials are concerned, a special type of gold specifically developed for a selective laser melting process has been used. For the designer, "it is very white, and more important, it is very hard, eliminating the need for a rhodium coating." The same hard white gold fitted very well with the manufacturing of his patented pen nibs which correspond to the part that touches the paper and deposits ink.

This creation already received positive reviews from people. Pen reviewer Dries Blues for instance affirmed that, "the medium-broad nib writes like a dream."

Van der Mast also introduced a slightly less extravagant version of the gold pen. The latter is made from titanium but plated in 24K gold. "For people who prefer the lightness of titanium, which is less than 1/3 of the density of gold, we offer our titanium version plated with a thick layer of 24K gold with a tiny amount of cobalt for better wear resistance," precised the creator.

Last, buyers may receive the luxurious 3D printed solid gold pen in a 3D printed aluminum case which can be coated in Nylon if requested.

MELISSA NG: her interpretation of Marvel's Ironheart armor

Melissa Ng wears several hats. 3D artist, designer and entrepreneur, she founded LUMECLUSTER, where Dreamers find courage, a platform where she enables people to discover or find fantastical armor, masks, jewelry or wearable art. Acknowledged for her various 3D modeling and printing masks, and collaborations with some leading companies of the 3D printing industry, she captivates today with her interpretation of Ironheart's armor for cosplayer Lexi Momo.

Melissa Ng

"Whether you love or hate change, there's no doubt that it brings new experiences", said the 3D printing mask maker. Although she was intrigued, she felt very excited to achieve this project.

Applying the Lumecluster aesthetic to Marvel's Ironheart design…

In the Marvel comics, artists would qualify Ironheart's armor as sleek. For Melissa, it's more sci-fi than her **"detailed fantasy-focus designs".**

While pointing out the design challenges, Melissa Ng realized she could make the look feel complete with a few 3D printed components: the helmet, the gauntlets and the art reactor. Her goal was to make the selected components more functional on the one hand, on the other hand, make it so the components won't look like they can kill the wearer.

She searched inspiration for her designs on the website of the Met Museum where she found a historical armor design. She thereafter designed the gauntlets and a harness for the reactor. She 3D printed on her Form 2, the arc reactor, helmet comb, and vambrace.

A few moments later, she molded and cast these pieces in a semi-rigid resin. With her LulzBot TAZ 6, Melissa Ng 3D printed the larger parts: the gauntlet pieces, the base for the arc reactor, and the helmet. The latter was printed in nGen, molded and then cast in a semi-rigid resin.

As far as the printing of the gauntlets is concerned, Melissa explained:

"The gauntlets were printed in Taulman 3D's PCTPE, which is not as neat or sharp as nGen when it comes to printing detail but super tough and semi-rigid (like, I could beat this stuff with a hammer and it would be fine). PCTPE is also a little fickle and prone to a bit of warping, so I decided to avoid printing the helmet in this material since I was working with a very limited time frame and didn't have time to deal with too many issues."

After cleaning up some components, all 3D printed components have been painted and airbrushed. The artist then finalized the LED installation and sewed some pieces including the flexible gauntlet material before the final check.

"Looking back, there are definitely things I would do differently but, overall, I feel pretty happy about the final result within the limited time frame", she affirms.

Eden Saadon uses 3D pen to create “3D Lace” couture lingerie collection

Israeli designer **Eden Saadon** unveils new possibilities for creation in the fashion industry. With the use of a 3Doodler 3D pen, Eden Sadoon raises the standard of fashion by thinking out of the box.

Recently graduated from Shenkar College of Engineering, Design and Art in Ramat Gan, Eden Saadon chose the 3Doodler 3D pen to achieve her final project.

Normally intended for kids, this 3D pen might drive her in new directions.

3D lace

3D lace portrays volumetric lace designs that presents amazing flora and fauna imagery. The creation of the **seven-piece collection of beautiful nightgowns and negligees** is based on the tapestry drawings of **William Morris**, the architecture of Frank Gehry, the paper and bamboo sculptures of Ai Weiwei, and the body sketches of Oskar Schlemmer.

“What is fabric, after all, but cloth made of threads?” Saadon asks. The collection of wearables is so light and can be associated to haute couture.

Very easy to use, she just needs 15 minutes to design a small piece of 3D textile while she would need several days to design a full garment.

For Eden, *“this technique does not produce any waste, and the Flexy™ material is bio-degradable, and thus environmental-friendly.*

In connecting between the known visual of traditional knitted lace and the new visual of 3D drawing of the synthetic material, I presented a new visual language, offering a wide spectrum of creative possibilities”, she said.

If Saadon focuses on lacy textile, it must be said that she sees in the 3D pen a tool that could help her earn her living.

“I don’t know where it will go, but it’s fun that there are 1,000 options,” said the young lady.

Formnext 2017

General overview of the 3D printing market

"A vibrant platform of innovation and networking formed a solid basis for outstanding business opportunities"

This year, the exhibition demonstrated that the 3D printing market is becoming increasingly mature.

During all four days, formnext cemented its status as a catalyst of innovation in modern production technology and additive manufacturing around the world. Numerous leaders in these industries were on hand to unveil their most prominent products to those in the know. Meanwhile, **a total of 470 exhibitors from 33 countries showed off an array of compelling innovations from various areas along the process chain of cutting-edge industrial manufacturing.**

Visitors, enthusiastic, were willing to discover the exhibition's dynamics as well as the quality and scope of the showcased products.

"The groundbreaking growth of this Fair is impressive. There are even more innovative technologies combined with several interesting start-up companies – and there are some real pearls amongst them. I, for example, have discovered a technology, which seemed to be technically unattainable. This discovery now offers us new opportunities for the application of our products in surface analysis", stated **Holger Rübesame**, Business Development Manager at Specs GmbH.

And this international presence…

In addition, formnext once again underscored its worldwide prominence in drawing 46 percent of its audience from outside Germany. This year's attendees included representatives from the world's leading OEMs and key suppliers from numerous fields of industry, ranging from the aerospace, automotive, and medical sectors to sport and oil and gas.

This participation shows the increasing use of 3D printing and its applications from all over the world which in turn led to a high level of visitor traffic throughout the exhibition halls as well as talks of high quality, much to the delight of the exhibitors in attendance.

"The formnext is simply the place to be," added **Dror Danai**, Chief Business Officer, XJET. *"There are visitors from all over the world and I can come here and meet everyone I need to meet in one place. It's a fabulous business opportunity. Every year we get more than we need and more than we expect from it."*

Next year's edition is scheduled to take place on 13-16 November 2018 in Frankfurt am Main.

formnext

International exhibition and conference
on the next generation of
manufacturing technologies
Frankfurt, Germany,
13 – 16 November 2018

ALL ABOUT 3D PRINTING

BY 3D ADEPT MEDIA

THROUGH THIS SPECIALIZED MAGAZINE FOLLOW THE EVER-GROWING EVOLUTION OF 3D PRINTING TECHNOLOGY IN VARIOUS SECTORS.

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