



❖ 3dpbm | Insights

AM Trends

Looking back on 2020, and forward to 2021

A Warm Welcome



Welcome to our 12th and final ebook of 2020! In the following pages, we look back on the additive manufacturing industry's evolution over the past year and look forward to what 2021 will bring.

2020 has, on the whole, been a bad year. But it has also been an eye-opening one—on societal, economic and personal levels. The ongoing COVID-19 pandemic triggered, or at least put a spotlight on, many issues in our world, from oppressive institutions, to weakened healthcare systems, to fragile global supply chains.

From our corner of the expansive manufacturing world, one thing that also became apparent is that 3D printing has a role to play going forward, especially as a solution to supply chain problems. In the early months of the pandemic, AM rose to the challenge, providing a way to make much-needed products, like PPE, on demand and locally. So while 2020 may have ripped the curtain back on many negative things in our society, the past year has also brought AM's benefits to the fore. Whether it's a year or a decade from now, we have no doubt that 2020 will be looked back on as a pivotal year for the AM industry.

And 2021? Read on for our own projections and predictions as well as those from leading AM providers HP, Materialise and Shapeways.

Wishing all of our readers and partners a happy and healthy new year!

Tess Boissonneault
Editor in Chief, 3dpbm



About

3dpbm is a leading AM industry media company. 3dpbm publishes 3D Printing Media Network, a global editorial website that has grown to become a trusted and influential resource for professional additive manufacturing.

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Analysis

Which key 2021 trends are in store for the AM industry?

Health and wellness will be a key adopter of 3D printing in 2021, leveraging the technology's ability to produce customized products like orthotics and footwear

by Davide Sher



3dpbm is looking forward to a new year of significant growth for AM, driven by aerospace, automotive and major investments from large multinational groups.
Image: 3dpbm

This year 2020 is coming to a close ('bout time) and it's time to start looking at what our 2021 trends analysis holds for the additive manufacturing industry. We need to be realistic: even as vaccines arrive and the COVID-19 pandemic eases, for many companies, next year may turn out to be even more economically challenging than the one that just ended.

At this time last year, we were closing up a fantastic year for AM and looking forward to a new year of significant growth, driven by aerospace, automotive and major investments from large multinational groups

entering the market. We had predicted that automation and automated workflows would be one of the most relevant trends and that AM market communication would become increasingly digital. With the exception of aerospace (but only to a certain extent), we were correct on all these points.

What does this show? Simply that—as many have noted—the pandemic has accelerated trends that were already underway, such as automation and digitization, while making others more urgent than ever, like supply chain resiliency, on-demand short-batch production and re-localization.

voxeljet posted one of its strongest Q3s in 2020, with systems revenue increasing by 64.2%.

Image: voxeljet



In all of these cases, AM stands out as an ideal solution, which is one of the reasons why the AM industry as a whole did not suffer nearly as much as other more traditional industries. Some AM pure players, such as voxeljet and SLM Solutions, even reached some important growth targets. voxeljet posted one of its strongest Q3s with systems revenue increasing by 64.2%; SLM Solutions closed the first half of its fiscal year with revenues of €31.2 million, a 90% percent improvement on H1 2019. The company now expects 20% growth for the full fiscal year and is closely monitoring the COVID-19 situation, exploring alternative businesses to the aerospace and oil & gas sectors, which make up the core of its business.

Wherever AM divisions or AM firms struggled and saw drastic cuts it was mostly as a result of reduced investments by mother companies who were suffering from demand reductions in their traditional core business. And those who did make cuts in AM-related departments showed a lack of vision.

One segment that is not suffering at all is AM services, especially those focusing on polymer AM technologies. Driven by much higher productivity enabled by HP, voxeljet, Luxcreo, Carbon and Origin technologies, some of the leading players in this segment, including Materialise and Proto Labs (but also Jabil and Shapeways and many others)

have been recording record demand and performing very well in a stock market that may be readying for a new wave of growth, this time centered on AM adoption in production. While this focuses mainly on polymers, metal binder jetting companies like Desktop Metal are challenging widespread skepticism in their promise that high throughput production will expand to metals. 2021 will be the year where we will know if metal binder jetting is truly a production-ready technology.

For these reasons, while we do expect 2021 to be a very difficult year on many levels in terms of global economic growth, we are quite bullish in our expectations for AM-market-specific growth trends. We see growth in terms of investments driven by many new and fringe areas of manufacturing: the space industry—a major AM adopter—is reaching new heights; EVs are finally taking off and are looking at AM for many of their parts, from powertrains to all types of enclosures. Even the construction industry—as we just reported in our latest AM Focus eBook—is adopting AM at an ever-accelerating rate.

Even aerospace, one of the industries that was hardest hit by the pandemic's effects, often continued to invest in AM as a means to streamline production and reduce costs. Other industries, such as oil & gas and the energy sector in general, continue to invest in AM to address the other major trend that emerged in 2020 (and that we had correctly anticipated by deciding at the end of 2019 to dedicate an AM Focus and eBook to this topic in our 2020 editorial calendar): sustainability. Even while dealing with the immediate challenges presented by the

pandemic, many AM companies continued to fine-tune their processes, materials and applications for more sustainable production. Needless to say, this trend will continue to grow in the next year.

Finally, whilst we do hope this will not result in anything more than “preparedness”, the increasing global instability has been driving growing investments in the defense sector. This area is also a major adopter of AM and weapons will always be part of the world's industrial mix.

For us at 3dpbm, 2020 marked a major step in our growth. We have experienced exponential growth in terms of traffic and industry-awareness and we successfully launched our AM Focus eBook series. Looking to the future, we launched 3dpbm Research, our market research area that focuses on leveraging our network of over 5,500 verified AM companies to build the largest databases of industry data and to produce the most accurate assessments and forecasts of AM demand and revenue opportunities. We continue to be optimistic for the future of AM and the fact that several AM-related stocks are near, at, or way above their three-year high further reinforces this confidence.

In light of the fact that effective COVID vaccines are now available, we expect distribution to require at least six to eight months to reach a level where international traveling can resume to near-normal levels. We thus expect several AM industry shows to return in their physical form in 2021—in particular, Formnext 2021, which takes place in November, may be able to perfectly capitalize on a new-normal. ♦

Roundup

3D printing applications, the best of 2020

A look back at our AM Focus topics of 2020 and applications in each that stood out.

by Tess Boissonneault



Kansas-based Dimensional Innovations leveraged Thermwood's large-format 3D printing technology to produce the 93-foot-tall memorial torch at the new Las Vegas Raiders NFL stadium.

Image: Thermwood

2020. A year we are all eager to move on from, but which we will not soon forget. I don't think I need to say why.

In the world of additive manufacturing, 2020 has been a mixed bag. While the industry on the whole has not been impacted to the same degree as others, COVID-19 has played a significant role in its recent growth and trajectory. When the world practically came to a standstill in spring 2020, 3D printing companies doubled down, leveraging their on-demand manufacturing capabilities to produce much-needed PPE for essential workers and even medical devices like nasal swabs and ventilator valves.

This timely response to the COVID-19 crisis put 3D printing on more people's radars and has helped to bring it closer than ever to the mainstream. For instance, when we broke the news on a 3D printed valve made in Italy, we drew in over half a million readers. From an editorial standpoint: this is a big feat for any trade media.

The pervasiveness of the pandemic may have led some to think that AM's evolution would be derailed or at least slowed. And while this was the case for a few months, it did not take very long for the industry to get back on its feet. (An indication, we think, of the dedication and enthusiasm of AM professionals!) As we look back on the

Bugatti has pushed the boundaries with its experimental Bolide vehicle, featuring several titanium 3D printed components.

Image: Bugatti | VW Group



year, we want to highlight some of the amazing things accomplished in 2020, which demonstrate how AM has continued to thrive and progress, even in this most challenging year.

The following “best of” stories are presented through the lens of our 2020 AM Focus series, which spotlight a different segment in the 3D printing industry each month.

We should also note that this is a non-exhaustive, highly subjective list. If we could mention every application we thought was significant, this eBook would be 1,000 pages long. All that to say, no hard feelings if your favorite application of the year didn't make the cut. Here are some of ours.

Automotive

Arguably one of the coolest automotive applications in 2020 was the Bugatti Bolide undertaken by French luxury carmaker Bugatti. Bugatti has been an active adopter of 3D printing in its automotive production, leveraging titanium AM to manufacture functional components like brake calipers.

This year, the car manufacturer completed an experimental study in which it created an ultra-light vehicle around its iconic 8.0-liter w16 engine. The company relied heavily on titanium AM to produce lightweight components. In the end, the weight of the vehicle was just 1,240 kg and it was

able to complete a lap of Le Mans in 3:07.1 min and reach speeds over 500 km/h. The innovative vehicle integrates titanium screw and fastening elements, as well as 3D printed titanium structures with walls as thin as 0.5 mm. The car also integrates hybrid components, including the 0.5-meter-long auxiliary drive shaft, made from high-strength wound carbon fibers and 3D printed titanium end fittings. In developing the Bugatti Bolide, the carmaker has demonstrated how metal AM can be used to construct lightweight parts that dramatically improve the weight-to-power ratio of specialty vehicles.

Medical

Evidently, the best medical 3D printing applications of the year are related to the coronavirus. Our most notable application was initiated by a medical team in Northern Italy in mid-March, as COVID-19 ravaged the region. Facing supply chain challenges, a team at an Italian hospital got creative when it urgently needed replacement valves for a reanimation device.

The hospital connected with a local 3D printing company, Isinnova, to reverse engineer and 3D print the device in the hospital. The 3D printed replacement valves were put into circulation right away, helping to connect COVID-19 patients to venturi low-flow respiratory masks.

This early application of 3D printing in the pandemic was key in showing how the technology could be used in these moments of crisis to help save lives when existing supply chains and medical stocks were disrupted. Of course, 3D printing was used

in many other ways to help manage the pandemic, including in the rapid production of face shields, hands-free devices and, crucially, nasopharyngeal swabs for COVID-19 testing.

Consumer

As with each category in this list, it was incredibly difficult to pinpoint one consumer application this year, with interesting products being made in fashion, sports, interior design and more. Ultimately, we've decided to highlight the launch of the world's first made-to-measure 3D printed e-bike.

The e-bike was launched this summer by Silicon Valley bicycle brand Superstrata, which has worked closely with composite AM service provider Arevo to develop its e-bike with 3D printed unibody carbon fiber frame. The bike frame is printed using a single pass of continuous carbon fiber thermoplastic composite. This means that the frame is constructed without any joints or glue. This unibody design results in superior strength (with no assembly-based weak points), high impact resistance and a significant weight reduction.

The two-wheeler also takes advantage of AM in other ways. Notably, through customization. The Superstrata e-bike can be tailored to the rider's height, weight and limb length, as well as to their preferred riding position and stiffness. In other words, the fact that the bike is made using 3D printing is not a mere novelty: the technology has added functional benefits to the consumer product, setting it apart in the e-bike market. The bike, which was unveiled in July, is scheduled to begin shipping this month.

Advanced Materials

One of the most impressive applications for composite 3D printing this year has been the successful completion of MAMBO (Motor Additive Manufacturing BOat) by Italian company Moi Composites. The boat was introduced this past fall at the 2020 Genova Boat Show and is the first real 3D printed fiberglass boat made using a thermoset continuous fiber composite material.

The sleek vessel is based on a design which would not be possible using traditional manufacturing techniques. With Moi Composite's Continuous Fiber Manufacturing (CFM) process, however, the unique composite structure came to life. MAMBO spans 6.5 meters in length and 2.5 meters in width. In addition to its unique organic structure, the boat integrates a navigation system, cork flooring, white leather seats and a 115 cv engine. Like with most applications on this list, the 3D printed boat provides a glimpse into the potential future of AM and how it can be used in the leisure maritime industry.

Italian company Moi Composites unveiled the 3D printed MAMBO boat at the 2020 Genova Boat Show.

Image: Moi Composites



Sustainability

Though the COVID-19 crisis took up much of the world's attention this past year—understandably—the climate crisis has also remained a top priority. At its core, AM has a sustainable mission that emphasizes on-demand, local production and less material waste. However, many innovative minds are also exploring the use of AM to improve sustainable practices and processes in other industries. At ORNL, for instance, researchers this year invented a 3D printed absorption device made from aluminum that is capable of capturing carbon dioxide emissions from fossil fuel plants.

The device, which consists of a heat exchanger with a mass-exchanging contactor and internal coolant channels, has the potential to reduce global greenhouse gas emissions caused by fossil fuels, which trap heat in the atmosphere and contribute to global warming. 3D printing enabled the ORNL team to create the device while meeting strict geometric limitations of absorption columns. Today, the research team is continuing to develop this 3D printed device which could improve our global emissions until our reliance on fossil fuels is drastically reduced.

Aerospace

While 2020 has not been an easy year for the aerospace industry—especially the commercial aviation sector—additive manufacturing has been a part of some of its exciting milestones. For instance, the FAA this year certified the GE9X engine, which integrates many printed components, for commercial flight. However, the application



Boom Supersonic achieved a milestone in 2020, rolling out its XB-1 supersonic aircraft with metal 3D printed components made using VELO3D's Sapphire system.

Image: Boom Supersonic

we really want to highlight is by Boom Supersonic, a Colorado-based startup developing supersonic passenger airplanes.

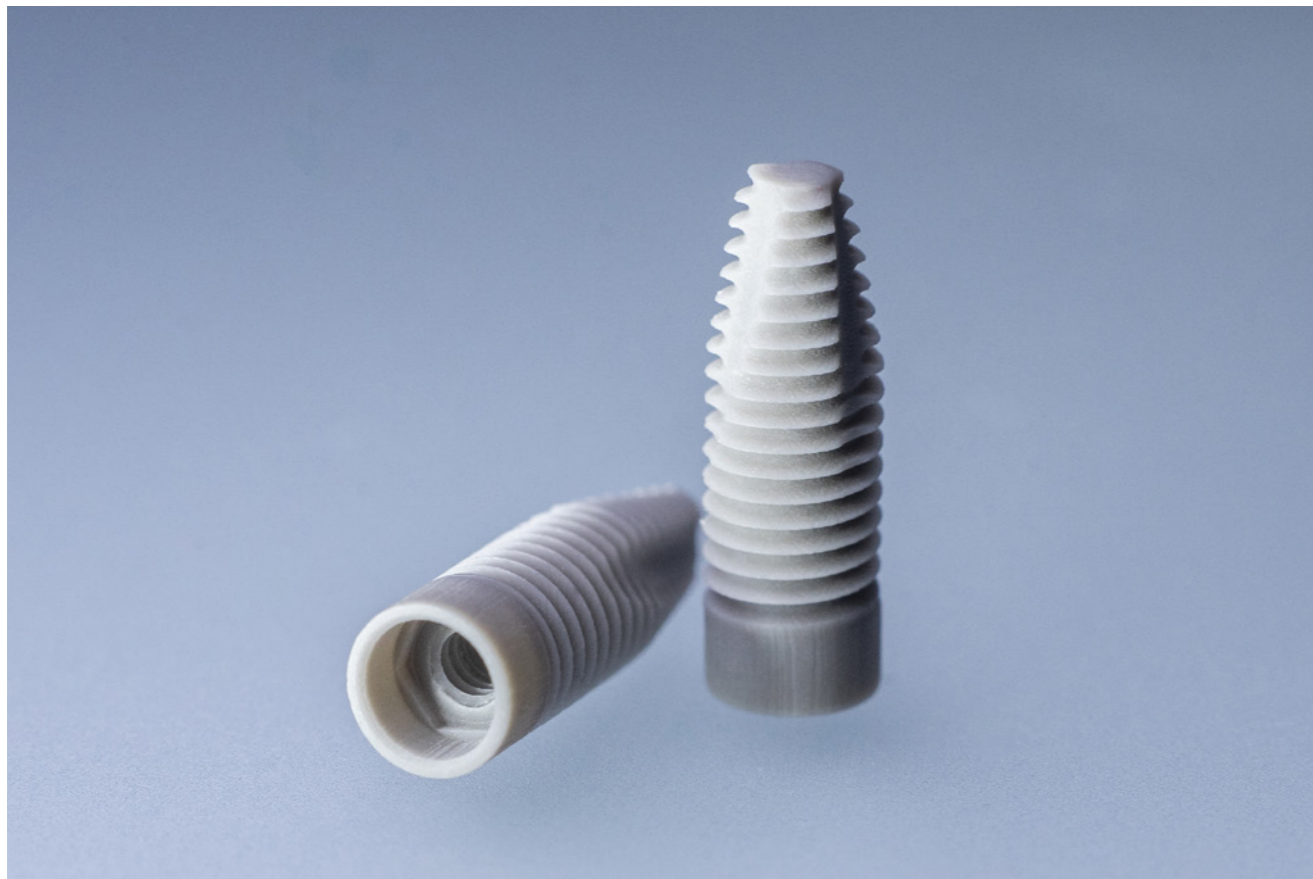
In early October, the company rolled out its XB-1 aircraft which features 21 flight hardware components made using VELO3D's metal 3D printing technology. The aircraft parts were printed from titanium and are used for engine hardware, environmental control systems and structural components. VELO3D's support-free technology enabled the companies to design parts with thinner walls and high aspect ratios. The XB-1 is the world's first independently developed supersonic jet and has been in development for years.

Automation

Automation, an underlying part of all new AM advancements, is admittedly a harder topic to pinpoint for specific applications. So we want to highlight a cutting-edge project that this year made significant progress. Launched in March 2019, the IDAM (Industrialization and Digitalization of Additive Manufacturing) project aims to improve the level of automation for LPBF 3D printing, making it viable (in terms of cost and scalability) for industrial production. Headed by a consortium of 12 partners, including GKN Powder Metallurgy and BMW Group, the project is particularly focused on driving the adoption of LPBF in the automotive sector.

The IDAM project has already made major advancements in its timeline, with partners currently validating the concepts of the pilot line modules for the automated LPBF workflows. Ultimately, two pilot lines will be established, one at GKN PM's facility in Bonn, Germany, and another at BMW Group's factory in Munich. These IoT-driven production lines will have the capacity to produce over 10,000 individual and spare parts per year, as well as at least 50,000 mass-produced components for automotive applications. They will also provide a blueprint for how other additive manufacturing-based, automated production lines can be established.

Endosseous tooth implants 3D printed using Lithoz's LCM ceramic AM technology can be used as the foundation for replacing a missing tooth.
Image: Lithoz



Dental

This year, the dental market continued its increasing reliance on additive manufacturing technologies, and AM partners bolstered the fruitful relationship with the dental sector by releasing new printers and materials. One of the most exciting developments in our eyes, however, has been the growing focus on ceramic materials for dental applications.

In July 2020, Austrian ceramic AM company Lithoz formed a new partnership with Dr. Jens Tartsch, an expert in ceramic implantology in Switzerland and the

“The memorial torch is made of 225 3D printed blocks made of a carbon fiber-reinforced polycarbonate composite.”

founder of the European Society for Ceramic Implantology (ESCI). Through this collaboration, the partners will identify new applications for ceramic 3D printing in the dental industry, combining the well-known benefits of ceramic materials for dental devices with the freedom and efficiency of AM. Lithoz is specifically focused on developing dental implant applications, like conventional dental implants and bone augmentation, using its LCM process and medical-grade ceramic materials.

Metal

More of a capability than an application, but still among the most noteworthy of 2020, is 6K Additive's UniMelt microwave plasma technology. The company, which we had the opportunity to speak with this past spring, is aiming to seriously cut back on material waste in manufacturing by transforming scrap metal into high quality powders for additive manufacturing.

6K's technology not only efficiently recycles metal materials and turns them into highly spherical particles, it also promises a near 100% yield for powders ranging between 15 and 45 microns as well as 45-106 microns. Gas atomization, by contrast, typically achieves yields of about 30%. 6K's technology marks a big step in the right direction for

AM, paving the way for a future in which AM fulfills its sustainable mandate, truly reducing material waste.

Construction

While some may consider this a controversial choice for “construction AM” because of its lack of cement, the category is a broad one and we would be remiss if we didn't highlight one of our favorite projects of the whole year: the 93-foot-tall memorial torch at the Las Vegas Raiders NFL stadium.

Secretly made by Kansas-based Dimensional Innovations using Thermwood's LSAM 3D printing system, the massive installation (a contender for world's largest 3D printed structure) was unveiled in September 2020. The memorial torch, which pays homage to the late Al Davis, a long-time owner of the Raiders team, is made of 225 3D printed blocks made of a carbon fiber-reinforced polycarbonate composite. Each printed block weighs about 350 pounds, and over 100,000 pounds of raw material were reportedly used to construct the impressive structure. The blocks were of course printed on the LSAM system and were subsequently machined to achieve tight tolerances. Raiders fans and 3D printing enthusiasts can see the massive memorial torch in person at the new Las Vegas NFL stadium. ♦

Trends

HP 2021 forecast sees economic growth driven by digital manufacturing

The company shares its predictions for the key trends in additive manufacturing



HP outlines key predictions for 3D printing in 2021 with insights from its global network of AM clients and adopters.
Image: HP

Just in time for 3dpbm's AM Focus on AM Trends 2021, HP has contributed by outlining key predictions about how 3D printing will further transform the manufacturing landscape in 2021 and beyond. Key anticipated trends include increased demand for personalization, along with higher productivity, new materials, increased focus on sustainability of processes and significant economic growth driven by digital technologies.

Increased demand for personalization and customization

The growing adoption of 3D printing and its ability to meet consumer demands will

increase personalization and customization. In particular, mass customization will enable manufacturers to produce personalized products at competitive prices.

Nine out of 10 respondents interviewed by HP among its global network of AM clients and AM adopters noted that they would pursue mass customization if they could personalize parts via 3D printing. Case in point, SmileDirectClub is digitally transforming the \$12 billion orthodontics industry using 3D printing to print dental aligners and Cobra Golf is disrupting the sports industry by building on a rapid shift toward product personalization to produce a first-of-its-kind 3D printed commercial putter.

Health and wellness will be a key adopter of 3D printing in 2021, leveraging the technology's ability to produce customized products like orthotics and footwear.

Image: HP



An uptick of software and data innovations to improve productivity

There will be an uptick in new software innovations that provide manufacturers with the tools and infrastructure to enable digital manufacturing at scale, leading to greater productivity. Advancements in software and data management will continue to drive improved system management and part quality leading to better customer outcomes.

55% percent of global respondents interviewed reported that “accelerated innovation” will see the most advancement over

the next five years, followed by 52% who said quality management will advance data and software and 50% who agreed data and software will enhance design for additive capabilities.

Innovation in materials for health and wellness advancements

The \$50 billion health and wellness industry is poised to see the most advancement in 3D printing in 2021. There is nothing more personal than the human body, and the opportunity to deliver highly personalized 3D printed parts such as orthotics, footwear and other applications that integrate

biomechanical data will be critical. These materials provide health and wellness professionals with ultimate control over the components produced and limitless possibilities in design. 55% percent of global respondents predict that the health and wellness industry will achieve the most innovation in the next five years.

Significant economic growth to support entire ecosystems

We'll also see significant interest in digital manufacturing technologies across regions when it comes to economic growth, and it's no surprise why: manufacturing is the engine that supports entire economies and ecosystems.

Nearly all global respondents (99%) believe that digital manufacturing technologies can lead to economic growth. Manufacturers are backing this belief with their budgets, with nearly three-quarters (71%) of respondents planning to invest in digital manufacturing technologies by the middle of 2021, and 85% indicating their company is planning to increase its spending on 3D printing.

Forming alliances for cross-sector collaboration and training

To continue advancing the industry and grow the population of practitioners, digital manufacturers must offer more professional training to more workers. As companies look to deliver more value to end companies, they will form new alliances and operate within new ecosystems. Two-thirds of the global respondents (64%) said more professional training services should be offered to further 3D printing. Additionally, cross-sector

collaboration is critical to the future of digital manufacturing, according to 85% of respondents.

Increased sustainability to drive business operations

Sustainability continues to be a key metric for business operations. As small businesses, governments and large enterprises increasingly assess and track their environmental impact, digital manufacturing is expected to play a key role.

Half (50%) of the target audience indicated 3D printing's ability to reduce waste, lower carbon dioxide (CO2) emissions and promote a circular economy. In addition, 3D printing enables localized manufacturing, helping reduce the complexity and environmental impact of supply chains.

Innovation will flourish from new materials and tools

When it comes to new materials and tooling capabilities, 3D printing not only is a more precise mechanism, but it also supports designs and structures that are complex and customized, making fabrication seamless. From reduced costs to improved functionality, new tools are a promising source of innovation that will continue to grow in popularity in 2021.

Heat-activated 4D printed parts, in particular, will show the most innovation and advancement in 3D printing over the next 5 years. Nearly half (48%) of global respondents say these “smart” parts have the most potential for advancement among 3D printing technologies. ♦

Trends

Materialise trends outlook for 2021, a “year of radical renewal”

by Kristof Sehmke
Global Communication, Materialise



Materialise was among the 3D printing companies to quickly mobilize when COVID-19 hit. Pictured is a 3D printed non-invasive PEEP mask.

Image: Materialise

As we mark our entry into the 4th decade of 3D printing in 2021, we also enter a decade with the potential for radical renewal. The COVID-19 crisis has had an enormous effect on every industry and continues to propel us into a space where we need to think differently. To think about where we need to push the boundaries of innovation and creativity.

With this being said, the legacy of 3D printing starts in 2021 with three key trends: going back to the drawing board to rethink manufacturing, enabling the personalization of not only products but also 3D printers themselves and creating new solutions, fast. COVID-19 has shown us that going forward we need to go back to the drawing board, focus on personalization and waste no time

in creating solutions. This is not the first time the world has seen this opportunity for change. Apple introduced the iPod right when the dot-com bubble burst. Airbnb came to life during the financial crisis of 2008 and Alibaba launched its online marketplace at the height of the SARS epidemic in 2003.

“In this time of great flux, we must dare to take bold steps and discard what is not future-proof. We need to harness the core values of technologies like additive manufacturing to move towards new ways of thinking and doing that have a meaningful impact,” says Fried Vancaen, Materialise CEO and Founder. We believe that additive manufacturing is meaningful when it empowers people to make better choices.

AM's ability to customize, to print with fewer components and with less waste means it can ensure solutions that are sustainable at their core.

Image: Materialise



The COVID-19 crisis has shown that AM can step up and provide meaningful solutions to emerging challenges. But so far, these solutions have not truly played to the strengths of the technology. The value of AM lies in being able to create things that no other manufacturing method can.

AM's ability to customize, to print with fewer components and with less waste, means that it can ensure solutions that are socially inclusive and that operate with sustainability at their core. The key to a strong legacy for our industry is to continue finding meaningful applications that take advantage of these qualities and to bring greater awareness to all that AM has to offer.

Our medical engineers worked together with doctors to create the Materialise Passive NIP by designing a 3D printed connector that holds together standard medical equipment. In the short-term, we are still locked into the COVID crisis, but the trends we foresee in the coming year look to successfully take us to the other side of this stronger, more flexible and ready for possibilities where 3D printed products or components bring more value.

Let's not forget that this value is often created at the beginning of the chain, in the digital capturing of the essential customer data and requirements. At the end of the chain, the 3D printing packages this value into a product. Let's rethink value chains as Apple, Airbnb or Alibaba did.

As Fried puts it, "As companies realize that they need to do things differently, AM empowers them to make a difference. And in this way the legacy of AM will not be what it allows us to make, but what it makes possible."

Back to the Drawing Board

Everywhere around us, the COVID-19 crisis is turbo-boosting digitization. At the same time, the climate crisis continues to press upon us a sense of urgency to reconsider the status quo of our economic and industrial systems. The continued emergence of such extreme crises means that we can no longer continue the way things have been going. We need to dramatically rethink the way industries operate and how we develop solutions to new challenges.

The pressures of these types of existential threats demand more than just incremental steps forward. Incremental processes of innovation also leave little room for revolutionary technologies like AM to make an impact. By allowing ourselves to completely rethink how we approach solutions, we open the door to radically new designs and innovative processes, something AM is naturally designed to do.

Take Airbus, for example. They recently revealed plans to accelerate the development of hydrogen-powered commercial jets and skip over the development of hybrid engines entirely. This bold jump means that by 2035, the world could see the first zero-emission, climate-neutral aircraft. Technologies like AM can play a big part in realizing these types of innovative concepts.

More than anything that came before, global crises are incentivizing industries to fast-track their technological innovation, and this climate of radical reinvention represents an opportunity for AM to really become instrumental in the areas of design and manufacturing.

According to Materialise CTO Bart Van der Schueren: "AM frees designers from the constraints and limitations of traditional manufacturing technologies, helping them to focus on the solution instead of the product. As a result, AM allows us to create performance, weight-saving, time and cost advantages. Until now, AM has really only been able to demonstrate its potential. Now it gets the chance to actually do it."

Starting fresh doesn't mean starting from scratch. By going back to the drawing board, we create the freedom to give new technologies a chance. To unleash new perspectives and possibilities. Then, the only limit to the change we can create is our imagination.

Personalizing the Process

"It is generally known and accepted that a unique and distinguishing characteristic of 3D printing is that it significantly reduces the cost of customization of products. What is less known and often overlooked is the importance of empowering engineers and operators to also personalize and optimize the printing process as such," says Materialise's Executive Chairman, Peter Leys.

Why is the customization of the process so important? Is the ideal AM world not a world where the operator simply pushes the start

button and then prints whatever product needs to be printed based on a pre-installed set of parameters that comes with the machine? Well, the illusion of a world where one standard printing process fits all applications is wrong, short-sighted and, last but not least, dangerously boring.

First, it is wrong because 3D printing is such a flexible technology that its potential would by definition be under-used if only a few standard processes would be deployed regardless of the product that is being manufactured. If you want to use additive manufacturing to its fullest extent, then you have to tweak each and every parameter of the machine and the process to the specific product that you intend to print. In a prototyping context, this possibility and the need was less crucial as the efforts to adapt the process to a particular product could only be depreciated over, at best, a very small batch of products. As AM is used more and more for mass production, the need to come up with the optimal process for a particular product obviously becomes more relevant.

Second, the one-process-fits-all philosophy is short-sighted, because it completely overlooks the fact that personalization and localization go hand-in-hand. Or to put it differently: 3D printers can only be deployed in a distributed manufacturing setting if the local operators have the freedom and ability to adjust the process to their local reality. Typically, the primary parameters would be set centrally and then more specific secondary parameters would be adjusted by the engineers in their respective locations to meet their specific, local needs.

“The importance of empowering engineers and operators to also personalize and optimize the printing process is often overlooked,” says Leys.

Finally, a world where an operator cannot contribute the added value of their knowledge and expertise to the printing process would be a dull push-the-start-button world. The world of standard processes would not only be boring; it would also be dangerous because it would be a world with less competition, as 3D printing facilities would not be able to distinguish themselves from other operators by adding their personal expertise and experience to the process. And lack of competition means, at the end of the day, lack of innovation.

So, the more operators are empowered to fine-tune, optimize and personalize the 3D printing process, the more the value of 3D printing will be unleashed. Yes, 3D printing should become faster, cheaper and more reliable. But to get there, 3D printing should also become more and more personal.

No Time to Waste

Materialise Vice President for Medical, Brigitte de Vet says, “COVID-19 has launched the world into a state of constant urgency. Healthcare professionals as well as regular consumers have been confronted with shortages and quality issues for both essential medical products and everyday consumer goods, a consequence of a global market model that hinges on centralized mass-manufacturing. Things we used to take for granted are no longer necessarily available or even appropriate, and new solutions need to be developed fast.”



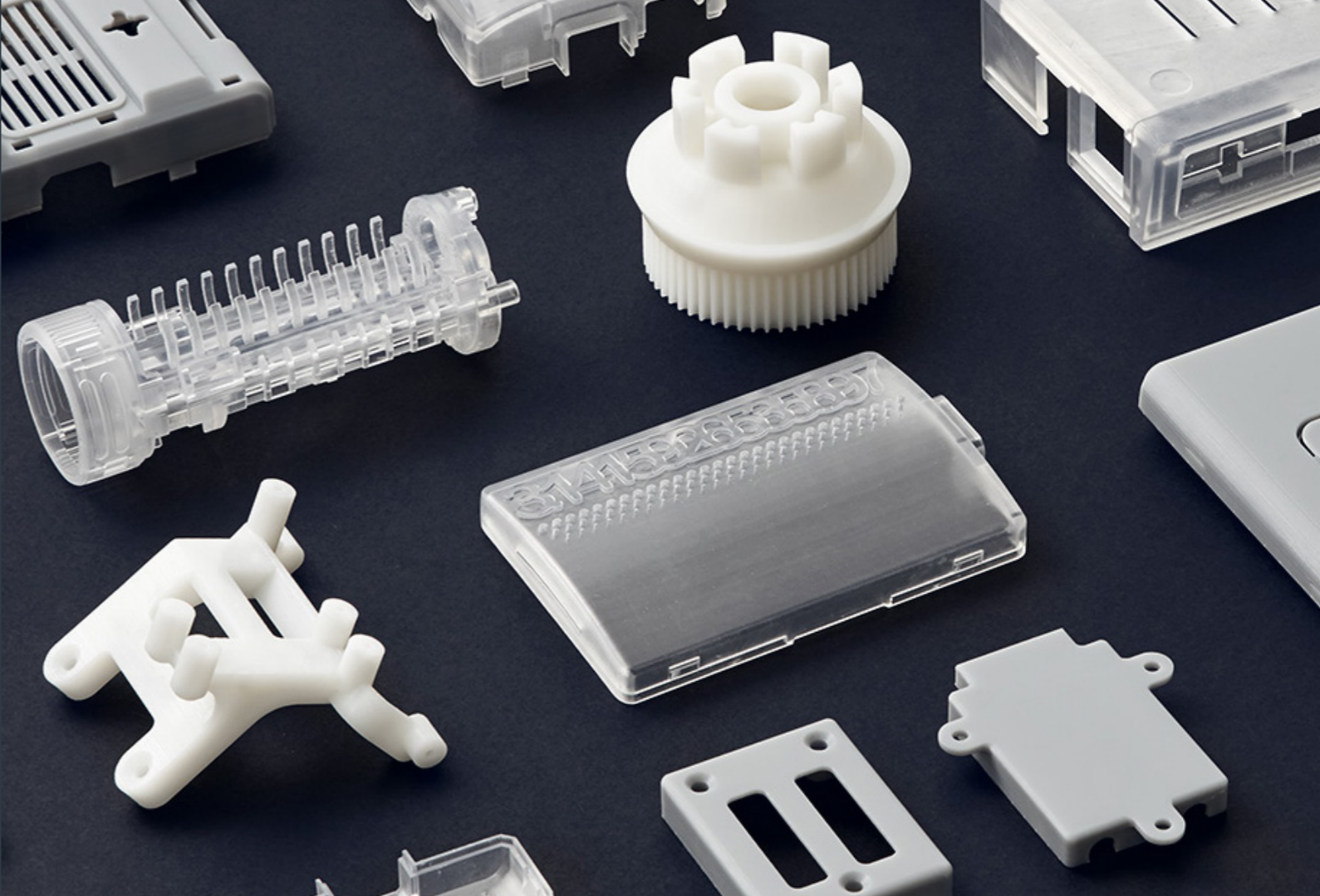
AM can deliver short-term ROIs, low-cost and low-risk manufacturing, but the entry point still has a lengthy learning curve.

Image: Materialise

Digitization is accelerating in every area as companies are investing in technologies that can help them adapt to this new normal of filling supply gaps, remote work and local solutions. But as part of this adoption, they need to make choices, and they will choose based on risk, cost and quick return on investment (ROI).

AM is one of those digital technologies that can deliver short-term ROI, low-cost manufacturing and low risk, but the entry point has typically come with a lengthy learning curve. Some companies started the AM adoption process 10 years ago and are well-positioned to make greater shifts to the technology, but companies new to AM no longer have the luxury of time.

Consultancy services can help guide businesses on their paths to AM success. Brigitte continues, “As a result, we see a growing trend for services that guide companies along this path. We see this for example in the medical world, where the value of personalized medicine is well known, but there is a low tolerance for uncertainty. New solutions need to offer strong evidence that they are safe and effective and can deliver a high-quality standard of care. Consultancy services can help minimize the risk of such big investments and accelerate the timelines by sharing their expert knowledge of what the technology can and can’t do, and the right manufacturing method needed for each unique case.” ♦



Trends

Shapeways 2021 predictions see more scaled up and distributed production

The global AM service provider has 3D printed 12 million parts to date

3D printing service Shapeways has manufactured more than 12 million 3D printed parts to date, using over 10 technologies and 75 materials.

Image: Shapeways

Shapeways 2021 predictions see the growing potential for advanced AM-specific software to increase production scale, along with more distributed manufacturing. To date, the leading AM service provider, for both B2B and B2C customers, has manufactured more than 12 million 3D printed parts using over 10 technologies and 75 different materials. Gathering insights from industry insiders, strategic partners and high-profile business and consumer customers, the company has identified a number of possible trends for 3D printing in 2021.

Software becomes imperative
3D printing software enables companies to scale as their business needs warrant.

“Scaling doesn’t mean just doing more, it means doing 3D printing efficiently and consistently,” stated Shapeways CEO Greg Kress. “Software makes it easier to create 3D printed products and guide the customers through all aspects of the process. 3D printing at scale is very involved in nesting, tray planning, file fixing, build planning and more. Software provides the insight required to get prints manufactured correctly and therefore makes it easier to produce quality products.”

3D printing leads the future

Additive manufacturing has already disrupted the eyewear, dental and hearing aid markets. It will continue to do so as more companies

“Materials, hardware and software for additive manufacturing will continue to attract more investors in 2021.”

constantly innovate product ideas and leverage 3D printing to make those ideas a reality. The core industries of aerospace, automotive and healthcare will continue to grow however other industries will present opportunities. 3D printing is about the final use of a product and doesn't always make sense for every product, however, for some, it's the perfect tool. Applications that have a high mix and require low volumes can take advantage of the benefits of additive manufacturing.

COVID-19 crisis continues

In 2020, COVID-19 shook the world and put additive manufacturing in the mainstream spotlight with PPE and healthcare production. Unfortunately, for the near-term, COVID-19 will still be a part of business planning and operations in 2021. Additive manufacturing is built for situations such as these that require businesses to adapt and adjust to market conditions.

Supply chain agility ramps up

Companies will continue to rethink redundancy, who their suppliers are and who to look to for high-mix-low-volume on-demand manufacturing. 3D printing will play a large part in the supply chain

conversations, as they have in 2020. In addition, more distributed manufacturing will be a consideration as end products are produced closer to the end-user.

Accelerating investments in 3D printing

Materials, hardware and software for additive manufacturing will attract more investors. Venture Capital firms and larger companies with investment divisions will find 3D printing companies to invest in for strategic positioning or to enable new revenue streams. In addition, the consolidation that we have seen across the market in 2020 will continue well into 2021. ♦

Shapeways also offers an online marketplace where makers and artists can sell their 3D printed designs, from jewelry and homewares to gaming and miniatures.

Image: Shapeways



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