

3D ADEPT MAG

Dossiers

- 2024 YEAR IN REVIEW : HISTORY REPEATS ITSELF? (PART 1)
- 10 TECHNOLOGY FEATURES THAT SHAPED THE AM INDUSTRY IN 2024 (PART 2)

Startup Area

- 10 ADDITIVE MANUFACTURING COMPANIES THAT TURNED STEALTH MODE OFF IN 2024
- WHAT HAPPENED TO 3D PRINTING VENTURES THAT TURNED STEALTH MODE OFF IN 2023?

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Table of Contents

Editorial	04
<hr/>	
Dossier	06
<hr/>	
- 2024 YEAR IN REVIEW: HISTORY REPEATS ITSELF? (PART 1)	
- 10 TECHNOLOGY FEATURES THAT SHAPED THE ADDITIVE MANUFACTURING INDUSTRY IN 2024 (PART 2)	
Startup Area	14
<hr/>	
- 10 ADDITIVE MANUFACTURING COMPANIES THAT TURNED STEALTH MODE OFF IN 2024	
- WHAT HAPPENED TO 3D PRINTING VENTURES THAT TURNED STEALTH MODE OFF IN 2023 ?	
Careers	26
<hr/>	
- JOY GOCKEL ON WORKFORCE DEVELOPMENT NEEDS AND OPPORTUNITIES IN AM	
Guest column	30
<hr/>	
- RAISING THE BAR FOR ADDITIVE MANUFACTURING WITH EXPERT SERVICE & DELIVERY – BEYOND THE STATUS QUO	
Business	32
<hr/>	
- DIFFERENCES IN THE PACE OF AM ADOPTION ACROSS REGIONS: THE LITHOZ CASE	
Opinion	34
<hr/>	
- LESSONS FROM THE AM INDUSTRY'S FRONTLINES	
Events	38
<hr/>	
- FORMNEXT 2024: THE PROBLEM VS THE OPPORTUNITY IN THE SOLUTION	

Forging a way ahead

“Difficult times create strong people. Strong people create easy times. Easy times create weak people.” It’s cyclical. These words may not be mine but as we are wrapping up 2024, I believe they offer a profound analogy to our industry.

For a year that many would describe as difficult with regards to the economy, the number of companies entering the market and those developing new and advanced solutions urge us to think otherwise. The truth is, although they are great, these innovations are sometimes not enough to immunize companies against economic slumps, slowing sales, management missteps, and myriad other issues that caused their demise and the destruction of immense shareholder value.

Whether they are consolidating or growing naturally, those who are still in the game teach us one lesson: One must have the discipline to stay the course (and even rebalance). With 2025 approaching, this time of the year is perfect to reflect and to embrace underlying opportunities with fresh perspectives.

Beyond a deep analysis of 2024, this issue of 3D ADEPT Mag sheds light on these opportunities. While we don’t know exactly yet how we will take advantage of them, the number of companies that are doing fine makes me confident that with a collaborative approach, we will discover it together.

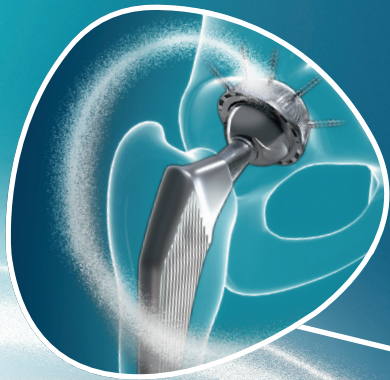
Season’s greetings.



Kety SINDZE

Managing Editor at 3D ADEPT Media

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2024 year in review: History repeats itself? (Part 1)

Whenever I sit down to write our “year in review” articles, I can’t help but notice that coincidentally, these articles are prepared right after Formnext – the world’s largest Additive Manufacturing event of the industry. It may probably look weird to you but since I usually leave that event pumped with positive energy and inspiration, it is tempting to limit what happened in eleven months to just one week. And just before writing a romance novel about our industry, the analyst in me tells the optimist part of myself: think twice – this industry is more than glitz and glamour.

And that’s what I did. I thought twice – and more. And the more I think...



...the more I see “financial stress”

Is that different from [what I pointed out last year](#)? Not really, you might tell me. I don’t want to sound contradictory but let’s take the example of Formnext 2024. Despite the [slight increase in figures compared to Formnext 2023](#), there were a lot of empty spaces across the halls and noticeable absentees.

This can be explained by the fact that exhibitors simply took less space this year. A company like **Oerlikon AM** told me that since they restructured their business [to focus more on the USA market](#), it didn’t make any sense to them to have a huge booth. Fair enough.

Others had a spot in their parent company’s or partner’s booth. That’s the case of Desktop Metal (DM) and its hard-to-notice spot in Nano Dimension’s booth.

Others simply didn’t show up – due to “financial constraints”. In the list of absentees, we can’t help but mention OEM **Nexa3D**. The OEM appeared last year as one of the top companies advocating for consolidation with three new companies under its umbrella: AddiFab, XYZprinting and Essentium. Its acquisition of filament maker 3D-Fuel didn’t go exactly as planned this year and the [startup returned to independence in August 2024](#). Following insolvency rumors after its absence at Formnext 2024, Nexa3D explained they had decided to focus inward – and prepare for the move to new headquarters. I guess in this case, the best I can say is that the future will tell us.

Beyond that Formnext week, the financial stress can be seen in the number of



companies that shut down their operations this year. *Coincidentally, that number almost equals the number of newcomers in the industry.*

Apart from **Apiumtec**, **Forward AM**, **Zeda Technologies Inc.’s Aerospace and Defense company** and **Velo3D** that are going through some financial troubles, this year, we bid goodbye to three material producers – **KIMYA**, **Braskem**, **Uniformity Labs** – one reseller – **3D FilaPrint** – one software company – **Sigma Additive Solutions**, and a machine manufacturer **Sintratec**.

We welcomed **nPower Technologies**, **VRC Metal Systems**, **Verne Additive Manufacturing Labs**, **Ecogensus**, **Fluent Metal**, and **Xenia**.

And **acquisitions**. It’s now a fact. Acquisitions are part of our AM journey. However, the reason behind each acquisition varies from one company to another. If last year, we shed light on the willingness of buyers to position themselves in this market, this year, these consolidations highlight the need to remain financially stable.

Unlike last year where we covered over [24 acquisitions](#), this year saw the reporting of about **15 acquisitions**.

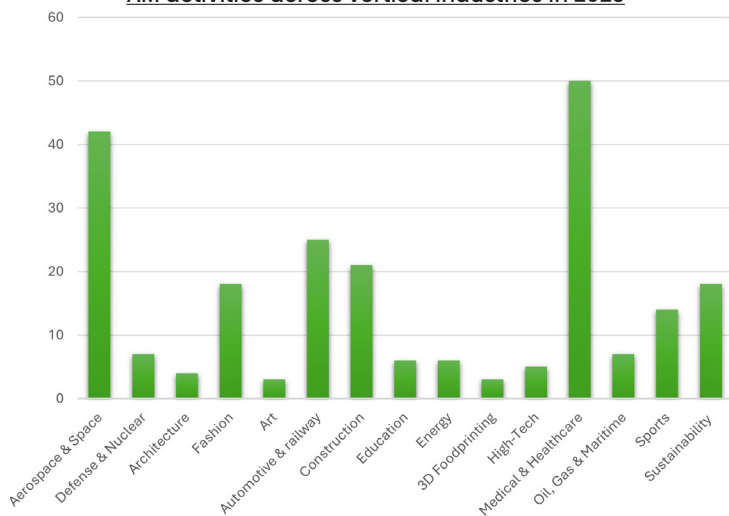
Buyer	Acquired	Exit stake
Siemens	Altair	Sandvik exits stake in BEAMIT
Nano Dimension	Markforged	
Anzu Partners	Voxeljet AG	3DFuel returns to independence
GoEngineer	Inceptra	
ADDMAN Group	Keselowski Advanced Manufacturing (KAM)	
Materialise	FEops	
Wall Colmonoy	Indurate Alloys Ltd	
Vision Miner	Addwise Manufacturing	
Sodick	Prima Additive	
Stratasys	Arevo	
Kymera International	Royal Metal Powders	
Zeda	The Orthopaedic Implant Company (OIC)	
Prototal	CA Models	
CurifyLabs	Mehta Heino Industries Oy	
LAB14 Group	Nanoscribe	

I am pretty sure we will continue to witness a wave of consolidations moving forward but I will keep in mind that to date, [those who bootstrap their business](#) seem to be in a more steady state than those who take VC

money.

...the more I realize that “applications become a unique selling point”

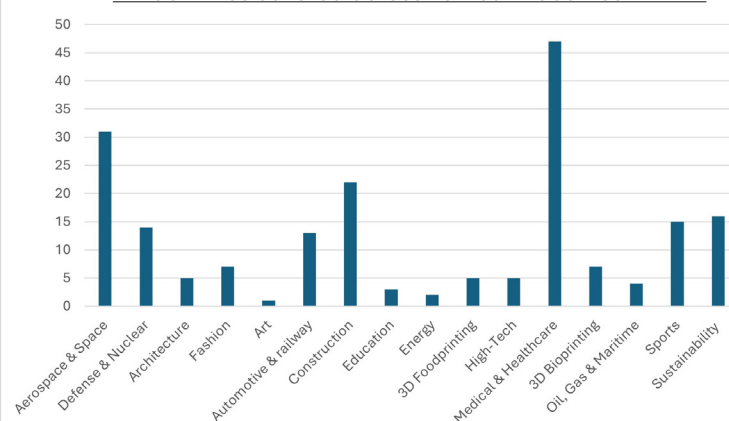
AM activities across vertical industries in 2023



Throughout the year, most of my interactions with 3D printer manufacturers were the same: they didn't necessarily highlight the capabilities of their 3D printers but rather the applications a specific 3D printer could deliver.

It comes down to what we once told you: applications make the industry evolve in a virtuous circle: *“the more designers design products, the more applications we will have. The more applications there are, the more materials will be developed, and the more printers will evolve or be introduced to the market.”* And in the end, a client will find themselves buying a complete package of solutions from an OEM.

AM activities covered across vertical industries in 2024



It's too soon to call it a trend but that's probably something we should watch out for next year.

...the more I see “defense” as the vertical that will propel AM technologies the most

“In a world of renewed conflicts and geopolitical rivalries, defense requires visionary leadership—including in advanced technologies;” **Josep Borrell**, Former High Representative of the European Union for Foreign Affairs and Security Policy / Vice-President of the

Image : infographics 3D ADEPT Media

European Commission said.

While this vertical industry raises a lot of concerns among AM enthusiasts and users across other industries, we can't ignore the fact that defense organizations across the world are investing heavily in key technologies.

In the AM industry, we see a number of events that provide a space for the use of AM in the military and defense sectors. In addition to the [Military Additive Manufacturing Summit](#) which is the first event to highlight the use of the technology across these sectors, other events increasingly spotlight AM technologies. They include AM industry events like Formnext as well.

Russia's attack on Ukraine may be one reason explaining this surge in new technologies, and it's crucial to acknowledge that this trend is likely to continue in 2025.

In the United States alone, the Biden administration has requested a budget of **US\$849.8 billion for the Department of Defense (DoD)** for fiscal 2025. The budget priorities may act as a catalyst for further industry spending in unmanned systems and the space economy. Specifically, the commercial sector is likely to continue advancing toward advanced air mobility (AAM) solutions. Finally, it is likely that, in 2025, aerospace and defense companies will prioritize resiliency and visibility in their supply chains to ensure the future of

their technologies, a [report](#) from Deloitte reads. Interestingly, [these are all the areas where AM has proven to be effective](#).

On another note, while the EU is home to 5 of the 15 largest global defense contractors [by market capitalization](#), the European defense industry landscape remains populated mainly by national players operating in relatively small domestic markets. While it is not clear yet how much budget has been allocated for fiscal year 2025, we do know that the EU has put in place [the European Defence Fund](#) (EDF). With a budget of €8 billion over the 7-year period of the Multiannual Financial Framework, several European organizations and companies will be brought together through common R&D projects.

...the more I see the rise of Asian AM companies

We do not have to emphasize the rise of Asian AM companies in this article to avoid unnecessary repetition [with our Formnext coverage](#).

...the more there is uncertainty about what's next

There was a time when most CEOs and investors kept saying that *"There's never been a better time to be in Additive Manufacturing."* The current market certainly makes it difficult to reiterate these words with confidence but when I see that vertically integrated AM businesses like [Domin](#) or [Conflux Technology](#) continue to strengthen their positioning, I find some beauty in that uncertainty.

Discover key AM applications

Additive Manufacturing (AM) is increasingly adopted across various industries for the most demanding applications and the less complex ones.

As a source for high-quality, accurate, and timely additive manufacturing resources, 3D ADEPT Media tracks and analyzes these applications – and continuously shares challenges and lessons learned by AM users.

Stay informed on the progress in various industries such as :

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10 technology features that shaped the Additive Manufacturing industry in 2024 (Part 2)

Before entering a new year, at 3D ADEPT Media, we have made it a tradition to sit down and discuss highlights, milestones, or solutions that have somehow marked our industry throughout the year. Reasons that may explain the choice of one highlight differ from one person to another. For some reason, the picks below underscore the ingenuity and resilience driving this ever-evolving field.



1. Fifty shades of large format Additive Manufacturing

It's an interesting time for OEMs manufacturing large-format 3D printers. The demand for such 3D printers increases over time and this **leads to the development of new solutions across other stages of the manufacturing chain**. Take the example of depowdering for instance, [the development of the depowdering system SFM-AT1000-S](#) from Solukon is the result of an inquiry from [machine manufacturer AMCM GmbH](#). Now that AMCM can tune 3D printers with building envelopes of 820 x 820 x 1200 mm or even larger, I guess Solukon's newly launched SFM-AT1500-S would be a great fit for such metal 3D printers.

That being said, LFAM is truly a trend regardless of the type of AM process whether we talked about composites 3D printing, LPBF, WAAM, polymer 3D printing, or even VAT photopolymerization. This year the common thread within most of the 3D printer launches is the ability to manufacture bigger parts in one single print.

2. Customization continues to be the manufacturers' priority

We have highlighted and seen some very cool applications this year. No matter how beautiful they may be, I am sometimes questioning their raison d'être. As money is currently the nerve of war, is customization enough to make AM profitable? Customization can even be part of the agenda, but is it necessarily linked to series manufacturing? So far and from our observation, we cannot always have both. However, those who have been making a profit with AM have been delivering series manufacturing services.

3. Semiconductors and defense are leading the way

Semiconductors and defense are the two vertical industries where a growing use of AM technologies

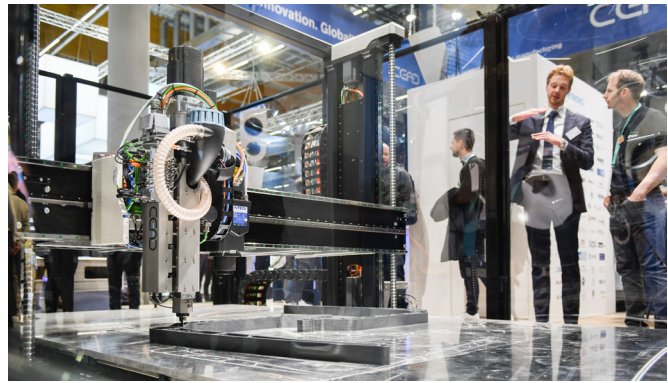


has been observed. These are the vertical industries one should watch next year.

Today's challenges in semiconductor production include global production capacity, long lead times and supply demand – all of which can be addressed by AM. If **VAT photopolymerization and LPBF processes** are the AM technologies that have been put forward the most this year for these applications, other technologies can also be

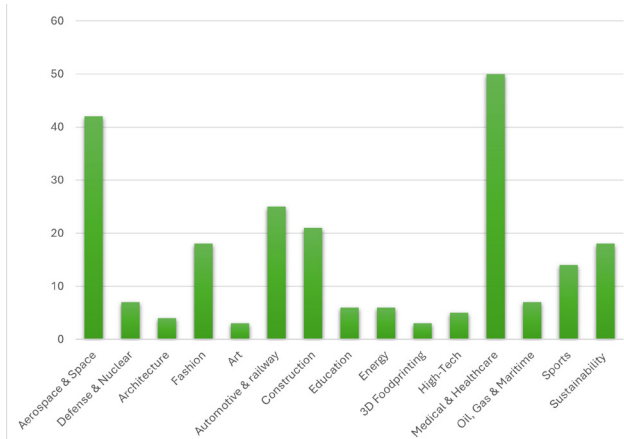
ideal production candidates.

Compared to last year, this year’s coverage analysis saw a rising interest of defense organizations in AM. As announced in the first part of this review (**P8 of this magazine**), we are not done yet. Whether it is in Europe or in the USA, defense organizations will continue to invest in AM. The number of events that shed light on the use of AM in this vertical is a testament to that. Despite the sensitive nature of the coverage of AM in this vertical, it would be interesting to see what AM can do better in this vertical industry.

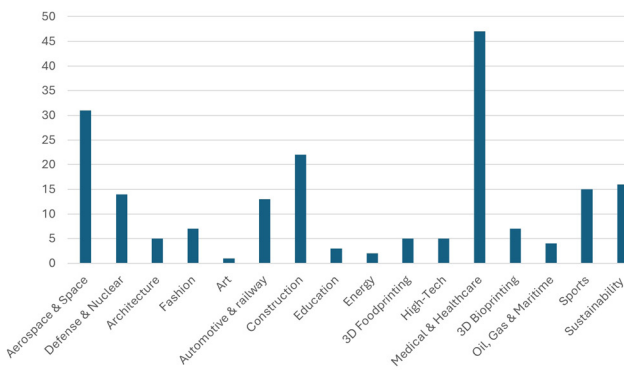


and its Halo “supercreator” – a large-format metal 3D printer described as being at the intersection of materials science and AI; [Fugo Precision 3D and its centrifugal 3D printing solution](#) as well as [ADDiTEC and its hybrid machine](#) which combines both Liquid Metal Jetting and laser-based Directed Energy Deposition with CNC machining.

AM activities across vertical industries in 2023



AM activities covered across vertical industries in 2024

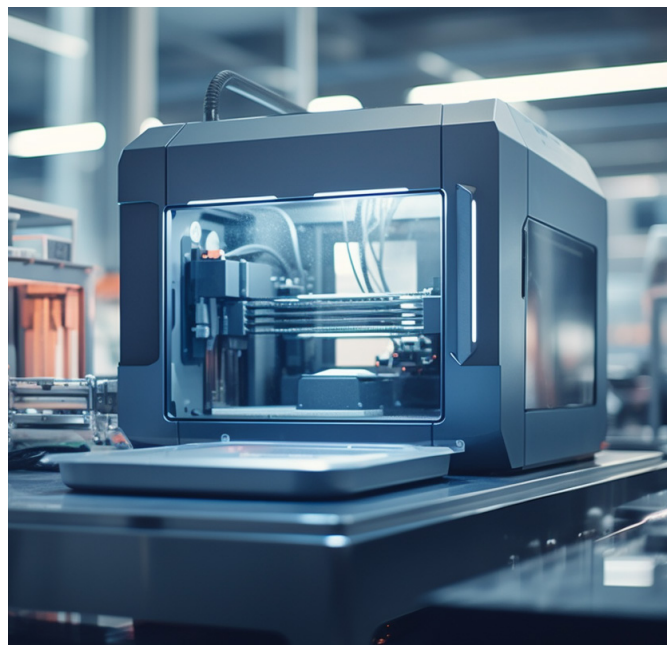


4. Material extrusion, the segment where we saw the most 3D printer launches

The majority of 3D printer launches covered this year fall into the category of **material extrusion**, closely followed by **powder bed fusion** and **VAT photopolymerization**.

Although most of these launches fall into allegedly known categories of AM processes, each 3D printer features a terminology specific to its manufacturer. This emphasizes the need **for a common language framework** that can allow users and technology providers to work together more effectively.

That being said, we can’t ignore OEMs who stood out from the crowd **with the launch of intriguing AM processes**. Among them, there is [Rosotics](#)



5. The rise of the entry-level 3D printer

OEMs fabricating desktop and entry-level 3D printers claim their [ability to meet the demand for industrialization](#) and to be honest after this latest Formnext, I am sure they can live up to that promise – at least part of that promise.

According to the latest report from **CONTEXT**, the low-end ENTRY-LEVEL category (<\$2,500) excelled with shipments up 34% sequentially, 65% YoY and 41% on a TTM basis. Creality continued to crush the competition with shipments up 64% YoY (and 45% for the full half year) accounting for 47% of all printers shipped in the price class during the quarter. Their growth rate was only bettered by Bambu Lab which again registered triple-digit YoY shipment growth (up 336%) giving them 26% of the global share. A total of 94% of shipments in this sub-\$2,500 category were from the top 4 vendors – **Creality, Bambu Lab, Anycubic and Elegoo**.

6. The AM software landscape continues to be fragmented

The more we advance, the more the software landscape becomes fragmented. It's probably the segment of the manufacturing value chain that reveals the most the need for a **common language framework and a platform where one can access everything**.

It's a landscape that is increasingly shaped by a growing number of AI-powered solutions. Although I recognize the [potential of AI-powered solutions](#), I can't help but remind product designers to remain cautious. Indeed, the more boundaries are pushed for AI-powered technologies, the more product designers should pay attention and do their best not to leave apart their creative brainstorming skills.

Furthermore, if software solutions to enhance production come in many shapes and colors, the common thread of this year's coverage remains their **ability to optimize manufacturing while delivering fewer failed builds**.

7. Process monitoring: Defect identification tools

To me, progress in defect identification is one of the best things that could happen to this industry. Its importance is simply underrated yet beyond the ability to improve surface quality and mechanical properties of 3D printed parts, its benefits may lead to material savings, enhanced machine capability, better testing time, and avoiding failure, crashes, and unnecessary testing.

In the list of solutions [highlighted this year](#), whether it is at the research level or in the area of solutions already commercialized, I am hoping to see more cases of defects one can identify "by listening" as they occur in a metal 3D printer and cases related to Phase3D's software solution.



Johns Hopkins APL experts are [addressing this issue by developing sensors capable of identifying and preventing these flaws before they occur](#). | Credit: Johns Hopkins APL

8. The combination of several manufacturing processes

Describing this point as a highlight is probably hyperbolizing since we usually note a combination of AM technologies and conventional manufacturing processes in applications that involve series manufacturing. However, it's quite unusual to see a **combination of two AM processes within the same part** – as discovered at the recent Formnext show.

One key advantage of such techniques remains the possibility to **deliver locally optimized material properties that can fulfill specific functions** and that's something that could be beneficial for a lot of applications if well pursued.



Legend: A section of a combustion chamber designed to operate in harsh environments. The manufacturing consists in applying DED on powder bed copper parts.

9. Tungsten 3D printed parts

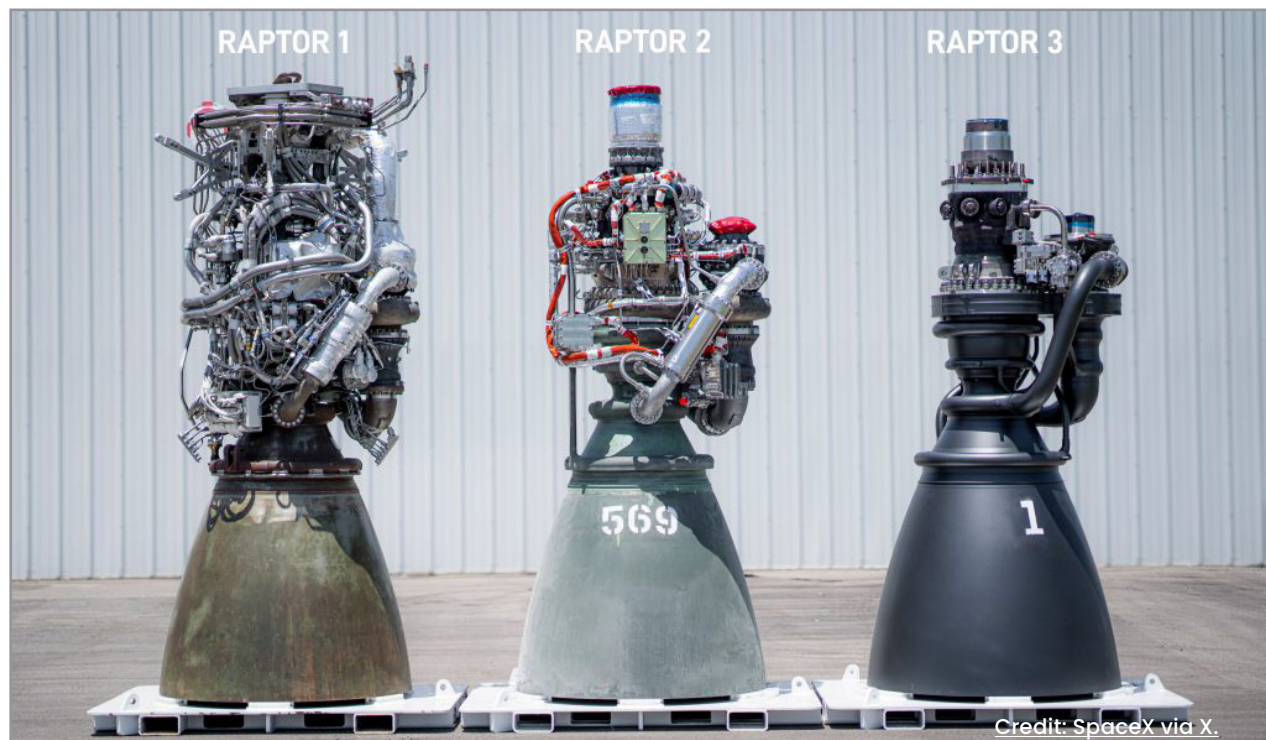
There is something fascinating about tungsten and the way manufacturers and researchers are trying to "crack the code" of its manufacturing. As a reminder, tungsten's hardness and extremely high melting point have always made it difficult to process via AM technologies. While LPBF is often mentioned as one of the AM processes that could process it, I want to shed light on part manufacturers who were willing to explore other techniques this year among which **Electron-beam additive manufacturing** as well as **laser powder-blown directed-energy deposition**.

10. SpaceX Raptor 3 gives faith in AM

If at any point you thought you'd lost faith in Additive Manufacturing, **SpaceX's Raptor 3 engine** should be enough to change your mind. This is certainly the application that grabbed the most attention this year and for good reason: Metal Additive Manufacturing played a pivotal role in transforming space exploration, enabling the transition from state-led programs to private enterprises by reducing cost barriers and shortening the development timeline for space technology.

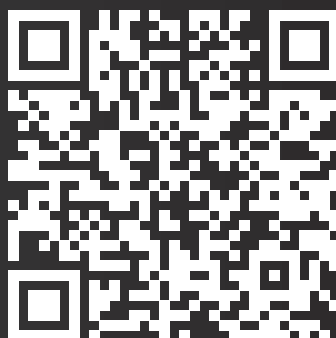
With this innovation, the team at SpaceX shared a zest of their recipe: less labor and inspection steps, less workforce, enhanced safety and a drastically optimized design.

What more can we ask?



YOUR GO-TO-SOURCE FOR KEY INDUSTRY EVENTS AND INSIGHTS

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10 Additive Manufacturing companies that turned stealth mode off in 2024

Even though there is an economic downturn affecting the industry, this does not prevent bold entrepreneurs and long-standing companies from trying their luck in the AM market. This year again, several companies made their debut in the industry. We have gathered below ten companies that caught our attention.

1. Xenia

Technically, Xenia debuted in the AM market in 2023, at Formnext but they appeared on our radar at the beginning of this year hence their presence in this list. Headquartered in Italy and founded in 1995, the company builds on its expertise in high-performing thermoplastic composites reinforced fiber and additives to commercialize new materials in the AM market. Its collection of high-performance composites is called **3DP MATERIALS** and includes unique resins combined with fiber and additives, adapted for use in any pellet-based type of FDM printers, for LSAM production as well as high-precision production.

[The company's 3DF Materials division](#) launched four new 3D printing filaments at Formnext 2024, designed to meet diverse requirements in industries needing lightweight, structural, and sustainable, materials. Those materials include XECARB® SL 3DF – 15% carbon fiber reinforced PA11, XELIGHT® 3DF – Ultralight PEBA, XECARB® 45 3DF – 10% carbon fiber reinforced PVDF as well as XEGREEN® 23 3DF – 20% carbon fiber reinforced PETG.



I met the team at Formnext 2024 and discovered some of their materials. The team seems experienced and their products seem to be of good quality. I just hope they will have a better journey than their fellow companies in the market that discontinued their activities this year.

2. Fluent Metal

Everything is catchy with this company: their name, their technology, and the fact that they are backed by industry veterans from Desktop Metal, Vulcan Forms, and the MIT Media Lab.

Based in Cambridge, Massachusetts, [Fluent Metal](#) launched out of stealth, with an additional \$3.2 million in venture capital funding, led by E15 with participation from Pillar VC and industry angels, bringing its total funding to **\$5.5 million**. Its technology is a production-grade liquid metal printing solution that is based on a “drop-on-demand approach”.

Using an inkjet printer-like approach, Fluent Metal describes its process as an alternative lean overhead process that is functional, and operational efficient – not to mention that it produces no waste and uses less energy than powder-based technologies.

Xerox is one of the first companies that I saw developing liquid metal printing. It’s a technology that I personally find super cool to see in action, but my feelings don’t count in a market that does not always recognize its potential. In the market, apart from Xerox whose [technology is now commercialized by AddiTEC](#), there are also ValCUN and [Mantle](#) that develop such solutions.

The good news in Fluent Metal’s case is that the people behind the company will give some credibility to this technology and I hope its capabilities could make the technology gain the spotlight it truly deserves.

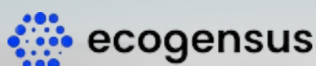


3. Ecogensus

By tapping into billions of unused resources, [Ecogensus](#) directly positions itself as a company that advocates for sustainability. The company develops materials from mixed wastes. These wastes are household trashes—such as food waste, diapers, plastics, paper, cardboard, and yard waste— that are transformed into engineered powders.

I like to see these high-performance polymer composite powders as an “all in one” series. They provide a sustainable alternative to conventional plastics by integrating seamlessly with 3D printing, injection molding, and similar technologies.

Using a patented method, the company converts these powders into **polymeric composite resins**. These resins are designed for easy integration into current manufacturing processes. The patent also describes polymer cross-linking to enhance the structural integrity and versatility of materials derived from processed solid waste.



4. Verne Additive Manufacturing Labs

This French company raised our curiosity with an **SLS PEKK 3D printing process**. So far, the use of this high-performance thermoplastic material has widely been associated with FDM 3D printing, for obvious reasons: in addition to its maturity, FDM 3D printing can reach very high temperatures during the extrusion/material deposition phase, which is crucial to process high-performance materials.

Named **Verne STROM**, the 3D printer is accompanied by a sieving, mixing, and a powder transfer system called **SM-1**. Key features of the machine include a build chamber that can go up to 380°C, 40W CO2 Laser, Theta-lens focusing (with fiber laser configuration available as an option), a build size of 220 x 250 x 400 mm (8.7 x 9.8 x 15.7 in), a build rate that goes up to 2 L/h – 35 mm/h – 1.4 in/h or even AI-enhanced scanning strategies and



Image credit: VERNE | Manifold produced in PEEK

laser power management.

The machine is yet to be commercialized but one can follow [its development roadmap](#) here.



5. Zylo 3D

Zylo 3D is a company that would have been founded last year to provide automated 3D printing solutions to the dental industry. The company has not made any formal announcements yet but has recently welcomed on its team **Shane Fox** – one of the [founders of Link3D](#), a company [acquired by Materialise](#).

I have always been a huge fan of Fox' work and what he did at Link3D, so I was curious to see where he will land next after selling his company. And the answer is Zylo3D – a company that bears the same name as its flagship product – a 3D printer that he describes as a “game-changer” in the dental industry.

Why? The “all-in-one” 3D printer would integrate build, wash, and cure functions in a fully automated system that requires no

human intervention.

The company's promise is quite strong: “You can print, wash, dry, and cure all in a single synced machine that requires minimal space and no prior printing experience while eliminating complexities associated with resin handling,” the company's [website](#) explains. Fox is bringing some credibility to a product that is quite fascinating. I can't wait to discover more about it through user feedback.

6. Fugo Precision 3D

[Fugo Precision 3D](#) is a California-based manufacturer that promises AM users they can achieve precision with sub-30-micron accuracy. The new 3D printer named **Fugo Model A** would integrate multiple post-production processes into a single machine, significantly reducing costs and increasing efficiency for manufacturers. With this all-in-one system, users can print, wash, dry and post-cure parts, streamlining the entire production process.

The 3D printer can process a wide range of photopolymers and as per the company's words, the 3D printer would be ten times faster than traditional stereolithography (SLA) printers. The company plans to deliver the initial commercial production machines in Q1 of 2025.



7. Sprybuild

[Sprybuild](#) brings an SLA 3D printer to the market. The machine would integrate a patented **continuous build process on a conveyor belt** - instead of a build platform and a rigid optical interface.

This metallic belt moves at a sharp angle to DLP projection and has a remarkably high degree of surface stabilization, achieved through the utilization of an efficient yet simple patented magnetic system. Additionally, it offers an automatic printed parts release feature that virtually eliminates printer downtime, Sprybuild explains.

Sprybuild's solid optical interface enables a continuous build process similar to, yet distinct from, the CLIP technology developed by Carbon3D. **The challenge** here was twofold: to **eliminate the need for inhibiting resin near the interface** and, at the same time, to **create "dead zones" where the resin could remain liquid**.

These zones are crucial for ensuring a steady flow of resin into the printing area, a key factor in achieving high-speed printing. Sprybuild's ingenuity led to the development of an interface that meets these requirements, ensuring sufficient resin flow and curing only where necessary.

In addition to speed that is enhanced, the 3D printer would enable cost reduction through automation and the use of widely available UV resins. Not to mention that automated slicing,

nesting, and the post-processing unit would make it easy to address complexity of the printing process.

The SLA 3D printer would be ideal for dental models, shoe soles, and orthopedic insoles, eyeglass frames and fashion accessories, hearing aids, prosthetic components, printed molds, and combustible models for precision casting.





8. SUGINO

As you may have seen in our Formnext coverage, [SUGINO](#), a Japanese newcomer in the AM market, debuts its **CASF** solution. This processing solution stands for **Cavitation Abrasive Surface Finishing**, and helps to remove abnormal layers from the surface of objects, perform surface smoothing and imparting compressive stress due to the cavitation effect by injecting high-pressure water in a tank filled with abrasive suspension.

Akiteru Tsuiji, Managing Director of the German subsidiary told 3D ADEPT Media that abnormal layers such as poor melting and cavities that occur from the surface layer to a depth of 200 um can be removed together with surface smoothing treatment and compressive stress. This results in increased fatigue strength and better fatigue life of the final part.

9. VRC Metal Systems (aka VRC)

There are less than five companies developing Cold Additive Manufacturing technology in the market and **VRC Metal Systems** is now part of them. [VRC](#) is not that “new” in the AM market: it was founded in 2013 after obtaining an exclusive license to commercialize the patent-pending cold spray technology. It licensed the patent after a joint ownership agreement between the South Dakota School of Mines & Technology and the Army Research Laboratory was completed. It thereafter expanded its scope of expertise to AM in 2021, with VRC Cold Spray being the first solution it introduced in the metal AM market.

Named **Dragonfly Cold Spray System**, the machine can be used across industries such as maritime repairs, aeronautical maintenance, repair and overhaul, and the energy sector. The Dragonfly™ modules include the **electrical assembly, the gas train, the powder feeder, and the heating unit**.

The entire system is controlled by a **VRC Pendant Controller**, allowing users to initiate a cold spray process with just a few button clicks. Internal data logging, available via both USB and non-USB transfer options, enables users

to record their cold spray processes anywhere and back up data for future analysis. The pendant can store up to 100 Cold Spray Recipes, providing flexibility for common use cases.





10. nPower Technologies

nPower Technologies is on a mission to address the scheduling challenges on the AM shopfloor through its **nPower Scheduler™** solution. The company is the brainchild of **ProfitKey**, a provider of software and services that helps SMEs in their manufacturing operations.

nPower Scheduler™ provides a rich, graphical interface and seamless integration with existing ERP systems, enabling users to visualize and manage jobs on the shop floor.

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What happened to 3D printing ventures that turned stealth mode off in 2023?



Credit: flō optics

Launching a company or breaking into a new market is one thing; achieving lasting growth is a whole other challenge. In the ever-evolving world of Additive Manufacturing, where innovation meets fierce competition, entrepreneurs are constantly seeking opportunities to drive the industry forward. At 3D ADEPT, we've made it our mission to spotlight the bold newcomers shaping this dynamic industry. With this in mind, we're circling back to some of the 3D printing ventures that emerged from stealth mode last year. Have they survived the test of time?

Among the wide range of companies that debuted in the AM market last year, 12 companies drew our attention: Data center solution company [EdgeCloudLink \(ECL\)](#), Finnish stainless steel manufacturer [Outokumpu](#), provider of filtration and separation of fluids services [Evove](#), KeyProd production monitoring solution provider [JPB Système](#), Swiss robotics company [Saeki](#), [3D BioFibR](#), a company that specializes in biomaterials for tissue engineering, vertical integrated company [flō optics](#), software company [Additive Appearance](#), manufacturer of 3D printed maritime spare parts [Pelagus 3D](#), Indian steel giant [ArcelorMittal](#), 3D printer manufacturer Forivory, as well as [Metafold](#), a newcomer in Design for Additive Manufacturing.

How have they navigated their AM journey so far?

EdgeCloudLink (ECL)

It can be difficult to guess how a data center solution company could leverage Additive Manufacturing but **EdgeCloudLink (ECL)** initially shared that it would use a construction 3D printer to build a zero-emission data center in Mountain View, California. These modular data centers would stand out from the crowd by the use of construction 3D printing and their ability to run on their own hydrogen-powered microgrids.

One year later, we can confirm that ECL has done its job. The company is finalizing the integration and commissioning of a 1MW data center, running on fuel cells at its headquarters in California. However, the CEO **Yuval Bachar** told our media colleagues from [DCD](#) that they finally did not leverage construction 3D printing as there was a vacant warehouse on its plot. According to Bachar, reusing a building is greener than 3D printing a new one *“and when 3D printing is needed, it will be the “easy” part of delivering a data center.”*



Outokumpu

The stainless steel powders introduced by **Outokumpu** can be used in various manufacturing processes like Metal Injection Moulding (MIM), and Binder Jetting (BJ). Beyond powder manufacturing, the company sought to create a viable AM ecosystem to support its customers in producing customizable 3D printed parts. This goal has not been met yet as the company first focused on strengthening its circular economy efforts which consist of producing annually up to 330 tons of metal powder from its own recycled material – 100% stainless steel scrap. This year, the company has entered the commercial production phase of this pilot project.

He also began several research and development cooperation projects with companies from a wide range of industries that want to use steel powder for new products. Outokumpu has been entering a collaboration with steel trading company **STAHL KREBS**, as part of the public-funded **project REACT**** by the German government. Another collaboration in the pipeline is within the medical and jewelry industry to work on nickel-free materials, which can be used for implants,



Credit: Outokumpu

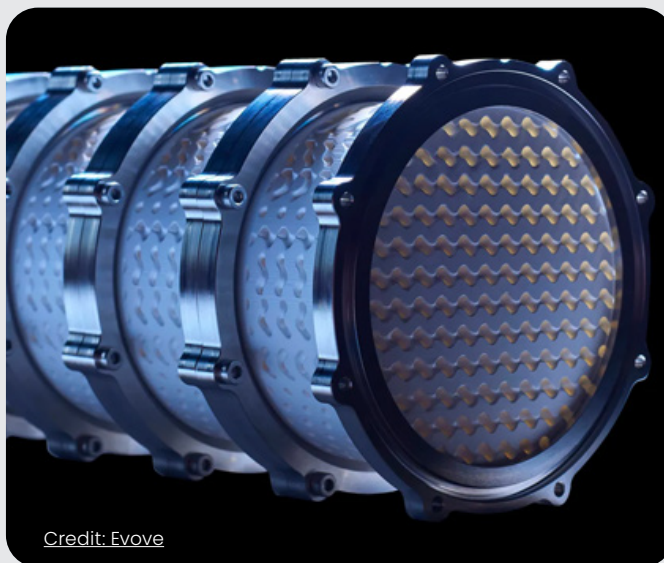
medical tools and watches. The collaboration is taking place via a publicly funded project by **EIT Raw Materials, HiPAM*****, led by **VTT Technical Research Centre of Finland**.

That being said, Outokumpu's primary focus remains the production of metal powders that are not yet on the market – suited for companies that use technologies to produce parts for demanding specialty applications. To support customer-specific requirements, Outokumpu operates its proprietary test laboratory, where the applications can be modified and validated directly on-site.

Evove

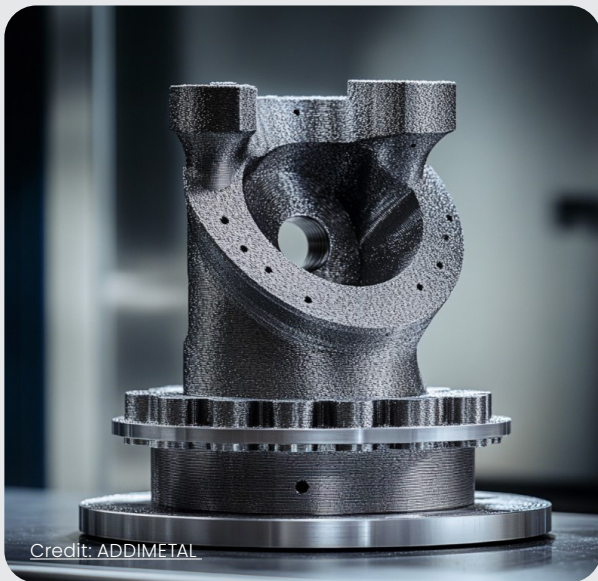
Evove is definitely making the list of vertical-integrated companies that I will watch next year. Its core business is simple: addressing the limitations linked to the production of membrane filters with AM. On the [heels of their recent collaboration with Lithoz](#), a short conversation with **Andrew Walker**, Chief Commercial Officer, taught me that the company's Separonics membrane facilitates the production of battery-grade lithium on-site without having to ship it elsewhere. Furthermore, the company's 3D printed membrane can filter lithium directly out of the brine, eliminating the need for ponds.

The conversation with Walker at Formnext also made me believe that



Credit: Evove

the company is doing well as it is working with Chile's SQM, the world's second-largest lithium producer, as well as Northern Lithium in the U.K.



Credit: ADDIMETAL

JPB Système

JPB Système took its first steps in the AM market, by acquiring a stake in France-based 3D printer manufacturer start-up, **Addimetal**. The company had promised it will be involved in the development of Addimetal's open hardware platform, technology and associated process to ensure both existing and future application needs are met. The company lived up to that promise as this year, ADDIMETAL announced the [launch of its flagship metal binder jetting 3D printer](#). Given ADDIMETAL's bold ambitions in the industry, we believe we will continue to hear about JPB Système.



Credit: SAEKI | Concrete formwork used for what is described as the world's largest 3D printed tower.

SAEKI

SAEKI claims its robots can make 3D printed formwork which can help in the manufacture of non-standard and custom construction elements risk-free. They say they provide a platform for low-volume production of non-standard concrete elements. They have remained quiet about their activities this year but their recent presence at Formnext 2024, at the booth of their partner **Sika**, indicates they are still in operations.

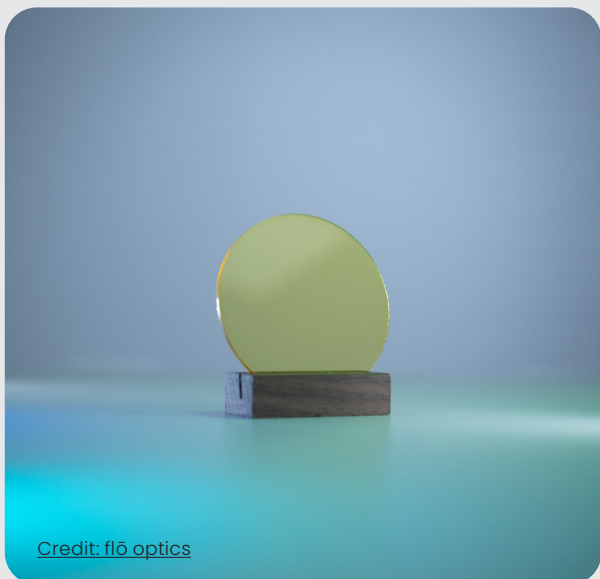
Visitors at the show could discover a tool used for the creation of a 3D printed tower. This tool – a concrete formwork – was produced using SAEKI's printing and machining solution.



Credit: 3D BioFibR

3D BioFibR

As a reminder, **3D BioFibR** focuses on collagen products that can serve 3D cell culture and tissue engineering applications, especially the cellular scaffolds segment. The company continues to be involved in several R&D projects in tissue engineering and has recently made its **µCollaFibR™** - Additive for bioinks and hydrogels – available through distributors worldwide.



Credit: flō optics

flō optics

flō optics has made a real splash last year in 2023 when it launched on the market. The company develops an [inkjet-based 3D printing technology](#) that applies unique, multi-material, multi-layer coatings to lenses. Ever since it signed an exclusive agreement with Yeda Research and Development Co., the company has remained quiet on its activities.

We have reached out to the company's CEO to have a quick update on their activities and we will update this article once we receive new information.

Additive Appearance

This one-year-old software company aims to enhance full-color 3D printing. The company develops a slicer solution that makes every layer count. It has been pitching at various events this year to attract potential investors who would help it grow its business.



additive
appearance

Credit: Additive Appearance



Pelagus 3D

Pelagus 3D, a provider of maritime 3D printed parts and a joint venture of thyssenkrupp and Wilhelmsen, seems to be doing well: the company is hiring, and is signing partnerships to develop spare parts for MENA maritime and energy sectors. The latest one has been signed with digital manufacturing firm [Immensa](#). On top of that, the company also recently achieved International Standard requirements ISO 9001:2015, ISO 14001:2015, and ISO 45001:2018 certifications across its global operations. These certifications demonstrate commitment to quality, environmental, health and safety management as they imply the implementation of a comprehensive Integrated Management System (IMS).

ArcelorMittal Powders

Not only were they present at key tradeshows of the industry, but they further gained momentum after the Paris 2024 Olympic Torch's prototypes were made by laser powder bed fusion, in ArcelorMittal Global R&D's Additive Manufacturing labs and using ArcelorMittal Powders' **AdamiQ™ 316L powder**.

I would define ArcelorMittal's year as a year marked by collaborations with the likes of Materialise and HP and by the development of key products and services such as the **AdamiQ™ algorithm**. This algorithm helps to address the complexities of the laser powder bed fusion (LPBF) technology, to maximize laser up-time, while minimizing printing time. As the company explains,



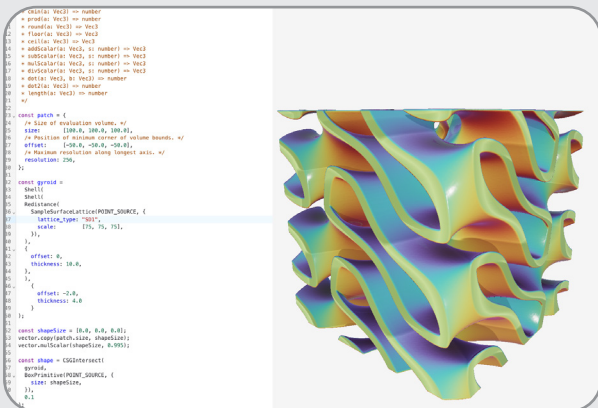
AdamiQ™ algorithmic optimization happens as a final step of build preparation. All build job parameters and configurations should be prepared and frozen by the customer (printer) in their version of the build job. The AdamiQ™ optimization is an add-on that improves the customer's build job in a single pass. A few minutes of re-vectorization can save hours of printing time.



Forivory

"Forivory", a brand of Jelect, unveiled the industrial **3D printer FT400** with a key focus on the Korean market to start the distribution. The company was supposed to prepare for overseas delivery after participating in SIMTOS in April 2024 but no information has been shared regarding this status.

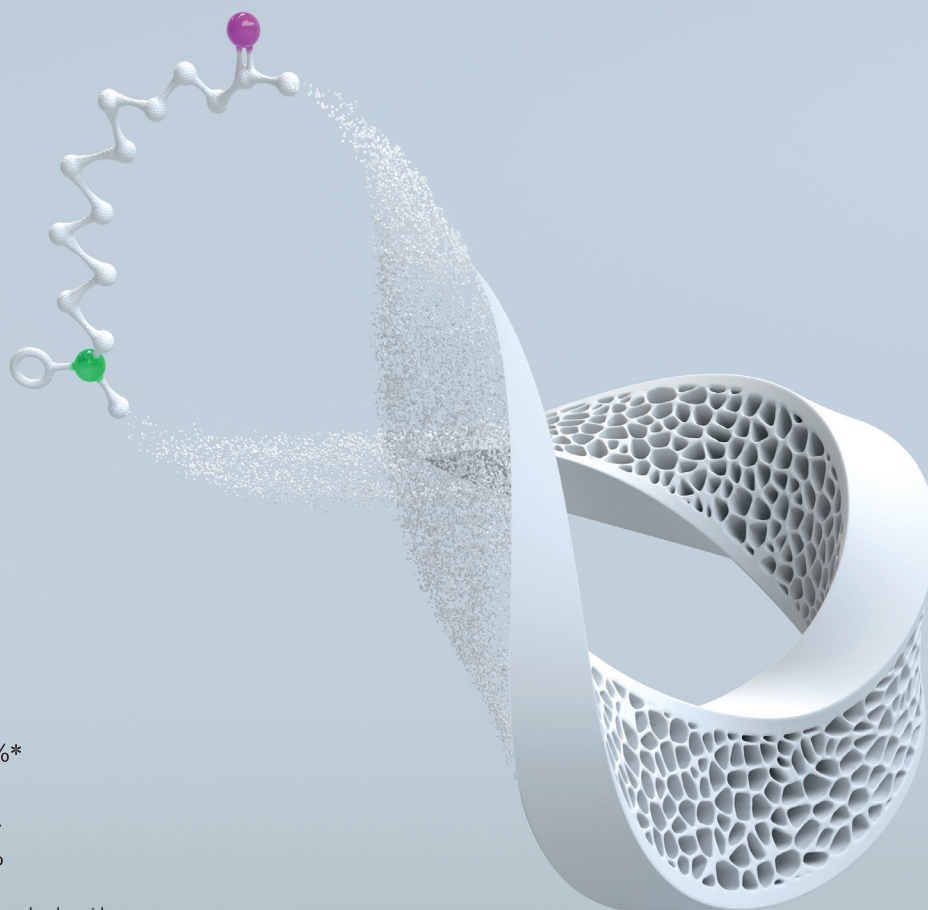
The [website of Jelect](#) does no longer feature the FT400 as part of its offering. It seems that the company has discontinued this line of products.






Metafold

Metafold continues to offer a commercially licensable API and high-quality developer experience for web-based geometry creation, editing, simulation, rendering and print preparation.

The company continues to demonstrate the capabilities of its software development toolkit through case studies and collaborations with companies.



-  Reusable up to 100%
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* Compared with the castor oil-based polyamides of Evonik's own Terra range.

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Evonik presents the world's first PA12 powder material for 3D printing that substitutes 100% fossil feedstock with bio-circular raw material from waste cooking oil.

Joy Gockel on workforce development needs and opportunities in Additive Manufacturing

Have you ever realized that most AM experts who have started their career in academia usually move to the industry side after some time? It's like a silent rule that's passed down among professionals. It turns out **Joy Gockel** did not receive that memo as she steered her career in the opposite direction.

The now **associate professor in Mechanical Engineering** at [Colorado School of Mines](#), first joined Mines from Wright State University where she was an assistant professor in Mechanical and Materials Engineering. Prior to her faculty position, she was a Lead Engineer at GE Aviation's Additive Technology Center.

When asked what triggered the move from a lead engineer position at GE Aviation's Additive Technology Center to the position of assistant professor, she said her natural place is academia.

"My industry experience motivates my work to be use-inspired, but we work on explaining the fundamentals behind the behavior that we observe. I also really enjoy mentoring students and introducing them to research. Often, it's the first time they are presented with a scientific problem that no one knows the answer to, which is exciting," **Gockel** explains.

Gockel's biggest achievements today are her students. "I am very proud of where they have ended up and the contributions that they are making to many fields, additive and more. A big challenge is keeping up with how fast the AM field moves. Both in my research areas and to make sure that my course content is up to date. There is so much to still learn," she continues.

In general, it is well understood that because AM represents a paradigm shift in design and production, well-trained talent—engineers and technicians—are pivotal to capitalizing on this technology. If this is true for many technologies, we have to admit that AM does not benefit



from the century of research and dedicated training that is the hallmark of conventional manufacturing techniques. That's the reason why most professionals who are working in the AM field, have built up their competencies through expertise on the ground.

"Key workforce needs are embracing the interdisciplinary approach and creating equitable access to learning resources. Design, materials and manufacturing are very intertwined in AM. It's key to have knowledge spanning these disciplines, as well as being open to talking to and learning from each other. We also need to make sure the opportunities to learn about AM and to enter the AM workforce are accessible for diverse populations," the associate professor explains.

This statement from Gockel emphasizes the challenges in teaching AM. The many nuances across the different processes and materials may make it difficult to deliver courses that uniformly increase a worker's readiness for an entry-level job. More importantly, they refocus the debate on the need for a [common language framework for the industry](#).

Hence the continuous reliance on “on-the-job training”

Today, there is an ecosystem of schools that teach AM programs and grant individual students AM credentials, certificates, and degrees. However, they should not forget that despite this theoretical knowledge acquired, there will always be “on-the-job training”.

*“This is true for traditional engineering disciplines too. The role of academia is to teach the fundamental knowledge required to grow into your specific career. This is where we have seen growth in education for AM. One of the key areas that we emphasize is **process selection** and making sure students are aware of the **breadth of AM**. This will help ensure that the right processes and materials are used for the correct applications,”* Gockel notes.

On another note, in the long list of essential skills often required from AM professionals, **critical thinking** (perceiving, hypothesizing, testing, and interpreting testing) and **soft skills** are often underrated. Most of the time, the focus is made on technical skills such as CAD, DfAM, finishing, safety or even reverse engineering. Technicians for instance, who can contribute to the detection of errors/failures and can communicate these issues are extremely valuable. Technicians can be part of the solution and therefore firms suggest more practical and hands-on training exercises to prepare them for the



manufacturing floor.

After that, **retaining that AM workforce** will be the next challenge to address. Whether we talk about management, operational, or technical teams, organizations are continuously in search of motivators to retain their talents. These motivators may be career progression, increased wage, and flexibility, in the end, an individual’s growth in the workplace is often tied to what that person considers a “better job”.

The entire workforce pipeline is concerned

While initiatives are implemented to enhance the skills and competencies of future AM users, it’s often easy to forget educators themselves. The **Alliance for the Development of Additive Processing Technologies (ADAPT)** aims to fill this gap.


The research and industry-academia consortium promotes collaboration within the scientific, research and provider communities to advance data informatics and advanced characterization technologies for additive.

“With our core research focus, we have research students performing independent hands-on work, digging deep into AM expertise. However, we also do outreach and have a training program for high school teachers. Engaging with the entire workforce pipeline is critical to ensure the success of the whole industry,” Gockel concludes.





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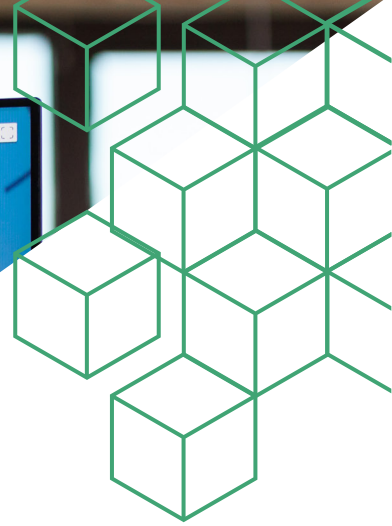
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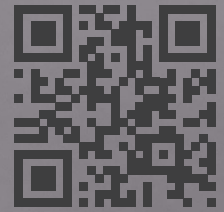
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Felix Manley
Co-Founder of 3D People
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Raising the bar for Additive Manufacturing with expert service & delivery – Beyond the status quo

Utilizing industrial 3D printing for any manufacturing discipline, whether for rapid prototyping, tooling, or, increasingly, production on demand, does not come without its own set of challenges, but deploying AM can also bring great advantages.

However, while all of these advantages are enabled by the additive systems that build the parts, in reality, the AM hardware is actually just one piece – albeit a vital piece – of an ecosystem of technologies that enable success with AM.

The building of the parts utilizing AM is the essential core of the manufacturing workflow, however what happens before and after the build is also vital to delivering high-quality parts in the most efficient and cost-effective way.

Here, we are exploring how a specialized bureau can raise the bar for AM with quality services that extend beyond just the 3D printed parts themselves.

A holistic approach to delivering quality

Experience and expertise go a long way to alleviating the challenges manufacturers face

when using AM. Working with a specialist AM bureau ensures that both come as part of the service from beginning to end. Look for an innovative business model that delivers high-quality end-to-end processes including fast, automated ordering and tracking at the beginning and dedicated post-processing and finishing capabilities at the end.

Automated ordering at the front end

Automation is a technology area that has also progressed significantly in the last decade. A forward-looking AM service bureau will have grasped this opportunity to develop and embed enhanced efficiencies into its ordering system to improve user experience. A dedicated automated ordering system will greatly streamline the ordering process, allowing clients to place their orders quickly and intuitively, while also providing full tracking capabilities.

An intuitive automated ordering platform should enable customers to upload their files, select material/s, and specify finishes with ease. It should then be able to provide immediate pricing feedback based on material cost, print

time, and complexity. Once the order is confirmed, the system can then provide status updates of all orders in real time, greatly improving transparency and communication.

By leveraging technology to automate ordering, AM service providers enhance customer satisfaction and operational efficiency, making AM more accessible and speeding up the front end of the workflow significantly.

Dedicated post-processing services at the back end

While we've established that the printing process is pivotal, the finish of the parts that come off the AM system often determines its quality and, importantly, its usability. Dedicated post-processing services are also essential for ensuring that 3D printed parts meet client expectations.

It's probably important to note here, [that post-processing is actually an umbrella term](#) for a number of stages that AM parts may need to go through after they come out of the AM system and before they are fit for purpose. This is especially true for powder bed fusion (PBF) AM processes. The term "post-processing" is often used interchangeably with "finishing", which is somewhat of a misnomer. With any PBF process there are a series of essential post-processing steps that are non-negotiable and must be undertaken prior to the AM-produced part finishing stages, which are optional. Thus "finishing" is actually an important subset of post-processing, not a term that should be used interchangeably with it.

Post-processing for PBF parts typically involves:

- Depowdering / excess material removal
- Cleaning

Of note for polymer PBF processes, support



removal is typically not required as the powder bed acts as the support system. Neither are heat treatments to cure the materials.

Finishing of parts can include any or all of the following to improve the aesthetics of the surface finish and, for some applications, the mechanical properties of the part:

- Surface finishing
 - Vibro polishing
 - Vapour Smoothing
 - Bead blasting
 - Sandblasting / Sanding
- Machining
- Colouring (Dyeing / Painting)
- Plating
- Inspection.

For AM production applications, finishing of parts is often a considerable, but overlooked, section of the workflow that can significantly impact the overall cost-per-part and project timelines. This is especially true if the final part characteristics need to be enhanced in terms of functionality and/or aesthetics.

Investing in dedicated finishing capabilities allows an AM service provider to offer a superior product quality, which is vital for industries where precision and aesthetics matter significantly.

Quality finishing, quite simply, differentiates an exceptional part from an average one. Any AM bureau that prioritizes high-quality finishing can cater to specific client requirements, under one roof, to raise the bar for AM parts.

To sum up

Any business looking to utilize the services of an AM bureau should identify one that is committed to the highest quality 3D printed parts but that also understands how to add value before, during, and after the build. The team at 3D People continues to deliver parts in this way to a growing constituency of clients that recognize their expertise in these areas. We welcome any questions – or, indeed, any challenging applications – from anyone that wants to know more.



Differences in the pace of AM adoption across regions:

The Lithoz case



Isabel Potestio

Last year, when machine manufacturer **Thermwood** launched its **Cut Layer Additive** solution, [an Additive Manufacturing process that does not 3D print](#), the machine received so much attention at RAPID+TCT 2023 in the USA that the team at 3D ADEPT Media that did not attend that tradeshow, was eager to discover it at Formnext 2023 – where the company has been a long time exhibitor. The only thing is, the machine was not showcased at the company's booth at Formnext. When we asked why, we were told the Cut Layer Additive machine was not that popular in Europe – or at least not yet. This short conversation led to a number of questions on the peculiarities related to the way AM is adopted across the world: do people buy more machines in Europe or do they invest more in applications? What does the

process for approaching AM in the USA look like? What are the similarities or differences with Asia? Etc.

While we aim to answer all these questions in this “business” segment, we are aware that there might be peculiarities related to the holistic experience of each company. That's the reason why, our goal will be to share the perceptions of companies and industry insiders headquartered/ based in key continents where AM is adopted at scale.

In the meantime, as charity begins at home, we caught up with **Isabel Potestio**, Director of Sales and Marketing at Lithoz to discover a European company's experience.

Why Lithoz?

Headquartered in Austria, OEM Lithoz is one of the ceramic 3D printer manufacturers that

has truly gone global this year. From the creation of [a Japanese technology network](#) to the integration into [the Manufacturing Technology Centre \(MTC\) in the UK](#) and the launch of a new [Bioceramics Center of Excellence™ in New York \(USA\)](#), Lithoz did not rest on its laurels. The company's activities demonstrate it bets **on a “glocalization” strategy** which implies a capitalization on global innovation and local production capabilities simultaneously.

Speaking of the company's first steps in both the US and Asian markets, Potestio explains:

“Lithoz sees localization as being absolutely critical in establishing oneself in both the US and Asian markets. This way, you can respond quickly to customer needs. In the USA, we started localizing from the very beginning with the launch of Lithoz America in 2017. We could then respond to customer needs more rapidly, establishing a strong presence and fostering trust among local clients. This proactive strategy has proven highly successful, and we now have numerous customers in the US engaged in serial production.

*In Asia, we also focused on localization, but here we relied more on **building personal relationships** and leveraging partner networks rather than establishing a physical presence. For example, the ceramic 3D printing network launched in Japan earlier this year, including Lithoz, AS ONE, Mitsui Kinzoku and Yogyokuen Ceramics, has played a major role in better establishing our foothold in the region. For us, this underlines the importance of partnerships in this market.”*



Barriers with doing business in Asia, Europe and in the USA

One of the very first barriers that might slow down the adoption of AM in a country is the **language barrier**. If that's not a secret, its impact is often underrated – especially in regions where it is crucial to build relationships and trust – two key elements that are pivotal in Asia for instance.

Potestio points out: *“Doing business in Asia, Europe, and the USA involves considering distinct cultural and operational dynamics. **In Asia, trust and relationships are extremely important.** Building these connections takes significant time and effort – but **once established, they form a successful foundation of long-term loyalty.** Without this kind of relationship, achieving results is nearly impossible in Asia. The process can be slower but is well worth the investment.*

*On the other hand, the USA operates at a much faster pace, **with a focus on immediate results largely due to venture capital.** Businesses and customers frequently change directions to capitalize on new opportunities – it is a results-oriented and fast-moving culture and you have to stay responsive.*

Europe also values results, particularly when it comes to solutions that are fully tested and ready to implement. However, decision-making can be slower compared to the USA, largely due to the lack of venture capital. Businesses are typically more cautious and focused on employing proven technologies – but once a technology is demonstrated to be effective for production, Europe provides a solid environment for scaling up, thanks to its stability and emphasis on sustainable growth.”

Thinking of our experience with the Thermwood Cut Layer Additive solution, we asked



Lithoz if some of their AM processes are popular in one region and not in the other. As a reminder, with more than [a decade of activities in the AM field](#), the company has already [acquired one company](#) and is the owner of three proprietary technologies (**LCM, LIS, LSD Print**). LCM which stands for lithography-based ceramic manufacturing remains the most popular one in the company's portfolio.

However, in a global market like the one our industry evolves in, the company focuses more on the different market segments instead of regions. *“We see similar demand in similar markets for each process across regions, and therefore do not specifically promote according to region, Lithoz LCM technology has seen significant adoption across multiple verticals, particularly including MedTech, aerospace, defense, semiconductor and machinery, and electronics. We do not see a particular trend depending on region – if a region has the industry, Lithoz has the technology to match,”* Potestio said.

Nonetheless, *“as the topic of sustainability becomes ever more relevant across the world, we're seeing growing interest in the market of green energy in each region. We recently partnered with Evove to 3D print highly efficient ceramic filters for water filtration and lithium extraction – this is a real stand-out application for us, and we look forward to unlocking more sustainable applications with Lithoz LCM technology in the future!”* Potestio concludes.

While we can't wait to share other tips and tricks to expand one's operations into new territories, we notice that there are certain realities that need to be considered regardless of the region in which you are operating.

The Lithoz experience is a testament that a market segment-oriented strategy is crucial to demonstrating the capabilities of one's technology and establishing some solid foundations on the international scene, but this recipe for success may not necessarily apply to everyone.

AM Industry

Lessons from the AM industry's frontlines

No one is very good at consistently getting market forecasts right. As a matter of fact, every time we tried, we were surprised by the turn of events. However, one thing is certain, at the end of each year or at the end of a given period or event, we should be able to sit down, reflect and draw lessons from what has worked and what still needs to be improved.

With that in mind, we posed a simple yet revealing question to industry experts: 'What lessons did you take away from the AM market this year?' From VC advisors to associations and AM specialists, their insights offer a multifaceted view of the market's successes and ongoing challenges.



Frank Carsten Herzog, founder and managing director of the VC firm HZG Group

For many start-ups in the 3D printing industry, it has become more difficult to find capital for new financing rounds. As investors, we no longer encounter exaggerated valuations as often as we did three years ago. The self-perception of start-ups is becoming more realistic.

Overall, the 3D printing market is growing. But a differentiated view is needed to identify specific growth opportunities. Because there is no such thing as the one AM market. Nor is there a single key to technological advancements' success. All players are called upon to extend or maintain their current leading positions through a constant willingness to innovate.

We will only be able to realize the full potential of 3D printing and other future technologies with an education system that introduces children to technology topics from an early age.



Tali Rosman, Business Advisor

Working with both AM innovators and AM investors & acquirers, I got to experience 2024 from all sides of the industry.

For investors and acquirers, the ghosts of failed SPACs and overhyped funding rounds still loom large, leaving behind write-offs and SPACs trading like penny stocks. Understandably, investors have become cautious—perhaps too cautious. The pendulum has swung so far toward risk aversion that I've seen good deals—companies with solid fundamentals and real traction—struggle to attract attention. It's the classic overcorrection: once you get burned, even lukewarm feels like

boiling.

For innovators, this pendulum swing is understandably frustrating. Early-stage companies are (finally) emphasizing product-market fit and disciplined financial behavior, but the pace of investors returning to the table remains slow. In my view, while skepticism is certainly warranted, overplaying it risks leaving real opportunities on the table just as the market begins to stabilize.

And the market is stabilizing, especially in the U.S. (when compared to Western Europe). One key driver is the Department of Defense (DoD), which has been accelerating AM adoption. As I covered in a report I published earlier this year on the DoD's use of AM, more applications are emerging in the defense sector. When coupled with the broader manufacturing reshoring trend, this creates significant potential for our industry moving forward. So, while 2024 has been quite the ride, 2025 is shaping up to be a year of renewed momentum and opportunity.

Kate Black, Founder & CEO of Atomik AM

This year, while the AM market has slowed considerably, I think there have been glimmers of hope. The market is starting to realize that its survival depends on doing things differently. One key lesson that people are seeing is that we need an overhaul in how we approach materials, with more attention to innovation and collaboration in this space. Companies like Additmetal, focusing purely on machines, or Amazemet, working with customers to develop bespoke powders, are great examples. My own company **Atomik AM** has been focusing on binders that synergistically work with powders and print heads so that we can create robust binder solutions for all customers. These organizations show the value of doing one thing exceptionally well and then working together to create an ecosystem that delivers exactly what customers need. I think the real magic of AM lies not just in printing complex geometries but also in creating parts with bespoke materials and functionalities and the industry is starting to see this. It's this kind of collaboration and specialists working together to push boundaries, that will lift the AM market from its current challenges. With this mindset, I think AM has the potential to rise stronger and shine again.



**Tuan TranPham, President,
Anisoprint (Americas & Asia Pacific)**

What is happening now is really needed. As in there needs to be a clean-up and consolidation but for 3D printing to further grow, the synergy with the other components of the 4th Industrial Revolution is needed. This includes a synergy with Robotics, OiT, Automation, big data, AI machine learning, and sensors.

On another note, the market is growing across all geographical areas. And with the growing presence of companies based in India, Korea, Taiwan, and Japan on the international scene, we have to keep in mind that beyond copy-cats, there are vendors with new innovations too.



The Mobility Goes Additive – Mobility and Medical Team.

As the leading international network for additive manufacturing, our reflection on 2024 lessons reveals both promising developments and concerning challenges in the AM market. We see consumer applications in design, lifestyle, and fitness sectors gaining visibility through the retail presence and personalized products; the healthcare sector is advancing with patient-specific devices and increased adoption across hospitals; and the defence sector maintaining strong AM implementation across European armies, though standardization remains crucial. However, the market growth has been slower than anticipated, and adoption isn't as widespread as it should be. Notably, well-structured companies

with reliable products have often outperformed heavily marketed venture-backed companies. Material qualification and knowledge persist as a challenge, with new materials entering the market faster than our understanding of existing materials' long-term performance. Specifically for AM medical applications, there is a vital need to establish standardized quality, regulatory, and reimbursement systems. Formnext 2024 confirmed AM's establishment in large enterprises and highlighted the untapped potential in SMEs. It also showcased innovations with great potential for transfer in healthcare and public transport sectors. Current economic challenges, suggest the

need for measured industry development. At this point, we should take a deep breath and jointly tackle all the unadopted areas with continuity and trust. It could be that the Facebook motto of «move fast and break things,» coined by Mark Zuckerberg, does not work in engineering. Our network emphasizes that successful AM market advancement depends on collaborACTION and user-driven knowledge transfer, reinforcing our vital role in bridging expertise and advancing AM capabilities across sectors. We are excited for a 2025 positively impacted by AM.

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As the hub for Additive Manufacturing, Formnext is the international meeting point for industrial 3D Printing experts and production professionals from a wide range of application industries. With the trade show in Frankfurt as well as content throughout the year, Formnext bundles expertise and creates a unique experience focused on an intensive, professional exchange and access to the latest AM solutions.

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FORMNEXT 2024 : THE PROBLEM VS THE OPPORTUNITY IN THE SOLUTION



In what has become an annual tradition for the Additive Manufacturing world, [Mesago](#), the organizer of Formnext, hosted this year 864 exhibitors (of whom 61% were international), and 34.404 visitors (of whom 48% were international) in Germany's financial capital, from November 19 to 22, 2024. These figures show a slight increase compared to the [same event last year](#).

For the first time in many years, I went to Frankfurt without any strict schedule. Many had highlighted the fortuity of encounters as one of the key strengths of Formnext, and I wanted to experience how true it is.

Although we couldn't tell it by the fancy booths, most of my conversations shed light on the economic downturn AM companies have to overcome – even from those I didn't expect. I couldn't help but think that any experienced marketer would say, the more a company struggles, the more it should invest in marketing.

While it is not my place to testify to the veracity of this assertion, my eyes were attracted by a **number of manufacturing strategies** I found interesting to explore, **applications and newcomers, an increasing focus on large-scale manufacturing** and the **rising presence of Asian companies**.

Manufacturing strategies that are worth noting

With over 800 companies, it's easy to get trapped in the wave of product launches usually highlighted across the different booths. In an effort to do things differently, or let's say, to see different results obtained with existing processes, we spotted different manufacturing strategies that highlight the importance of combining two manufacturing techniques; we also spotted different solutions to increase productivity and simply new solutions that could enhance part production.

Combination of two manufacturing techniques: AM + traditional manufacturing processes

In the wide range of processes that could be combined, it's easy to see the combination of metal Additive Manufacturing and CNC Machining. At Formnext, specialty chemicals company [Altana](#) drew my attention to applications one can achieve by **combining AM with injection molding**. Since the split with [dp polar](#), Altana has been focusing on the development of high-performance resin materials suitable for DLP, LCD and SLA 3D printing technologies. At Formnext, the company demonstrated it is possible to **save costs in tooling** by showcasing a **power socket** manufactured with injection molding and AM. As per the explanation of **Dr. Anne Asmacher**, Project Leader in the AM team, the outer part (the frame) of the power socket has been injection-molded as it is a standard design produced in injection molding. The center part, the cardholder or the switch can have tailor-made designs – and thus can be manufactured via AM before the final assembly. In this case, the center part was produced using AM and Altana's **High Performance 4-6700 VP**. Ideal for final parts production, the material provides a good balance between toughness and impact resistance.



Another key highlight at their booth was the **use of indirect 3D printing** to close the gap between small series and high-volume applications. The picture below is a good example of that. The mold has been produced by AM service provider [rpm – rapid product manufacturing](#) using Altana’s Mold 3000 VP. The water-breakable cast material is part of the series of One-Shot-Molds (OSMs) for usage in injection molding applications. The enhanced water affinity facilitates easy mold removal in water or aqueous environments. Additionally, it minimizes unwanted swelling, helping to prevent deformation or cracking of the final part. These 3D printed molds were thereafter used for the production of [Harting’s](#) connector parts. Ideal for medium and long runs, this type of manufacturing process allows for greater flexibility in engineering designs.



Combination of two AM techniques

When we talk about combining two manufacturing processes, the first idea that comes to anyone’s mind is the combination of AM and a conventional manufacturing process. **Graham Matheson**, R&D Project Manager at [Oerlikon](#), piqued my interest in the [Disco 2030 project](#). The project involves 9 partners among which Oerlikon and aims to combine the advantages of PBF and DED to enable the manufacturing of multi-material lightweight, complex geometry components that can operate in harsh environments. At the Oerlikon booth at Formnext, one could see a **section of the combustion chamber** whose parts were printed separately with DED and LPBF before being assembled.



According to Matheson, such manufacturing is all about applying DED on powder bed copper parts. It comes to answer a problem faced by multi-material joining techniques such as brazing,

solid-state welding or mechanical joining. With these techniques, industrial designers have to deal with machining the parts first (made of different materials), before joining them with the ideal technique in a second step. The problem in proceeding this way, is that this may negatively affect the design freedom

of multimaterial devices and create “dead spaces” in areas where two dissimilar materials are joined, thus negatively impacting the part’s weight. Furthermore, it does not allow “graded” materials to perform at their best. By combining DED and PBF, the research team can deliver locally optimized material properties that can fulfill specific functions. There is still a long road ahead before the DISCO2030 Project becomes a manufacturing standard in Europe, but if it does, it will likely replace traditional methods such as die casting and mechanical assembly of multiple parts.

Increasing productivity with AM

Any production manager will tell you that any time spent on activities other than manufacturing components is viewed as unproductive waiting time. Over the years, OEMs have developed solutions that could enhance productivity inside and outside the build chamber. These solutions are enabled through automation in powder bed processes.

Machine manufacturer [pro-beam GmbH](#) showcased at Formnext how it could increase productivity with **up to three build units** – allowing industrial users to ensure production 24/7h within their facility. This solution will benefit automotive manufacturers and industries that are looking to achieve series production with AM.

Enhancing part production through new post-processing technology

Among the various tools that can be used to enhance part production, I have always found post-processing technologies more tangible as it is easy to assess their capabilities. At Formnext, [SUGINO](#), a Japanese newcomer in the AM market, debuts its **CASF** solution. This processing solution stands for **Cavitation Abrasive Surface Finishing**, and helps to remove abnormal layers from the surface of objects, perform surface smoothing and imparting compressive stress due to the cavitation effect by injecting high-pressure water in a tank filled with abrasive suspension.

Akiteru Tsuiji, Managing Director of the German

subsidiary told 3D ADEPT Media that abnormal layers such as poor melting and cavities that occur from the surface layer to a depth of 200 um can be removed together with surface smoothing treatment and compressive stress. This results in increased fatigue strength and better fatigue life of the final part.

Newcomers and applications

With the wide range of solutions that continuously pop up in the market, we've made it a rule to shed light on newcomers that are taking their first steps in our industry. In addition to **SUGINO**, we also discovered **UNIWAY**, a Turkey-based resin 3D printer manufacturer who debuted at Formnext. With a key focus on the jewelry industry, **Mustafa DULGER**, General Manager of Uniway, explains that their wax-based 3D printer can achieve 30% more output in one print job.

Another rare find of the show was **Carboganic**, a Belgian startup that develops different biocarbon based FGF and filament 3D-printing compounds in various polymer formulations (PET, PP, ABS, PLA,...). These materials are used across different fields, such as orthopedic applications, automotive, yachting, construction, furniture and more. To demonstrate the capabilities of their solutions, the company showcased during the show a mold for **an electric racing car and seat shells for wheelchairs**.

On a different topic, a variety of applications helped to demonstrate companies' expertise and solutions. While it is often complicated to shed light on applications delivered for the **defense industry**, we can't help but notice that more and more companies are serving that industry.

That being said, from medical



and dental technology to the packaging, automotive and mechanical engineering industries, and from architecture to aerospace and many other sectors: the broad applicability of Additive Manufacturing across numerous industries was strikingly demonstrated by the multifaceted supporting program and the various showcases.

The bad and the good in the rise of Asian companies

While Australia was the partner country of this Formnext edition, one should note that there was an increasing number of Asian companies in the show. As a matter of fact, among the 864 exhibitors of Formnext, **145** came from Asia – and out of this number, **101** came from China. These numbers encourage to take a closer look at the different expertises that pertain to each region. While we will

dedicate more features to this analysis in the coming year, we can already tell that metal 3D printing developments are standing out from the crowd.

Apart from the **VoxelDance** Raid that occurred on the third day of the show, emphasizing the stereotype of copycat linked to Chinese companies, one should be able to give other OEMs the credit they deserve as they are going the extra mile to stand out from the crowd.

Imagine a company that would like to leverage 3D printing for prototyping purposes... When I look at the quality of prints delivered by FDM 3D printers like those of **Bambu Lab**, I don't see any interest in investing in an FDM 3D printer that costs about or more than 10 000€. To date, Asian FDM 3D printer manufacturers are gradually taking the biggest market shares in this area.



On another note, a quick overview of the profiles of Asian exhibiting companies at Formnext reveals that most companies specialize in the development of industrial machines and materials. With [SeeAnn Solution](#) and [Aspect, Inc.](#) being the only companies of the continent at the event providing software solutions, we are tempted to think that the development of software solutions is not the greatest strength of Asian companies.

It takes all types to make the world go around, so I guess, if there are not enough software providers in the continent, there are always other solutions elsewhere that could help meet the needs of AM users.

And now?

Innovations at Formnext often made me leave the financial capital with ideas and hope for a better world. I have to admit that I left this 2024 edition of the event with mixed feelings. While the quality of exhibitors and innovations showcased continue to testify to the technology's potential, the news of **KIMYA** ceasing filament production and **Forward AM** filing for insolvency – all of them released during Formnext – highlight a growing uncertainty within our industry.

It's too soon to provide accurate feedback from all AM companies on this. However, one thing is certain, anything that can help increase faith will continue to help this industry advance, slowly but surely.

Stay tuned for key insights into medical 3D printing

Get ready to learn about significant insights in the field of medical 3D printing. Experts in this field differentiate between medical care and healthcare. While medical care is a service, healthcare is a broader industry or system, of which medical care is just a part. In this section, both terms are often used interchangeably to discuss the influence of Additive Manufacturing technologies in these fields.

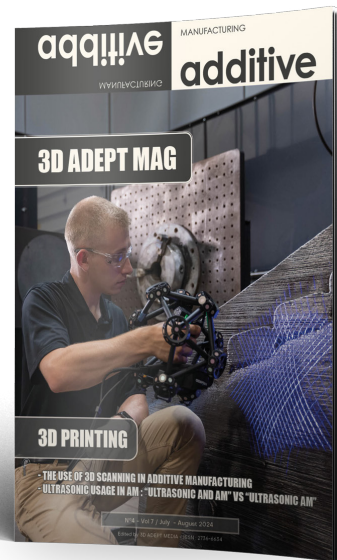
While questions remain about how commonplace AM will become in health care, reimbursement policies regarding medical 3D printed devices or regulations, we can't remain silent about the growing number of applications achieved in the field. In the end, the more applications there are, the more likely it is to reach a consensus on a regulated use of the technology.

Discover the latest 3D printing technologies designed for this field as well as key applications that foster the growth of AM in healthcare and medical.



INDUSTRY EVENTS

2025



EUROPE

Advanced Manufacturing for Aerospace & Materiel

February 26–27, Bristol, United Kingdom
www.defenceiq.com/events-advancedmanufacturing

5th International Conference on Electron Beam Additive

Manufacturing (EBAM 2025)
 February 26–28, Erlangen, Germany
ebam.fau.de

Fraunhofer Direct Digital Manufacturing Conference (DDMC 2025)

March 12–13, Berlin, Germany
www.ddmc-fraunhofer.de

AM Forum Berlin 2025

March 17–18, Berlin, Germany
www.am-forum.de

The 14th International Conference on Hot Isostatic Pressing (HIP 2025)

April 6–10, Aachen, Germany
www.hip2025.com

3rd European Military Additive Manufacturing Symposium

April 8–9, Bonn, Germany
veranstaltungen.dwt-sgw.de/?v=168

rapid.tech3D Additive Manufacturing Con

May 13–15, Erfurt, Germany
www.rapidtech-3d.de

EPMA – Use of Powder Metallurgy Technologies in Aerospace

May 20–21, Sandviken, Sweden
www.seminars.epma.com/event/aerospaceseminar/

WAAmathon 2025 (Wire Arc Additive Manufacturing)

May 21, Berlin, Germany
berlin.industrial.group/en/waamathon/

6th International Symposium on Additive Manufacturing (ISAM 2025)

May 21–23, Dresden,

21st Plansee Seminar

June 1–6, Reutte, Austria
www.plansee-seminar.com

+INDUSTRY 2025

June 3–5, Bilbao, Spain
plusindustry.bilbaoexhibitioncentre.com

ADDIT3D 2025

June 3–5, Bilbao, Spain
addit3d.bilbaoexhibitioncentre.com

3D Print Congress & Exhibition Lyon

June 3–5, Lyon, France
www.3dprint-exhibition-lyon.com

TCT 3Sixty 2025

June 4–5, Birmingham, UK
www.tct3sixty.com

The Advanced Ceramics Show / The Advanced Materials Show

July 9–10, Birmingham, United Kingdom
advancedceramicsshow.com
advancedmaterialsshow.com

Euro PM2025 Congress & Exhibition

September 14–17, Glasgow, Scotland
www.europm2025.com

The European Additive Manufacturing Congress

September 14–17, Glasgow, Scotland
www.euroam2025.com

Formnext 2025

November 18–21, Frankfurt am Main, Germany
www.formnext.com

USA

Additive Manufacturing Strategies 2025

February 4–6, New York, NY, USA
www.additivemanufacturingstrategies.com

Military Additive Manufacturing Summit 2025

February 11–13, Tampa, FL, USA
www.militaryam.com

International Conference on Injection Molding of Metals, Ceramics, and Carbides (MIM 2025)

February 24–26, Costa Mesa, CA, USA
www.mim2025.org

AMUG 2025

March 30–April 3, Chicago, IL, USA
www.amug.com

America Makes' Spring Technical Review & Exchange (TRX) with RAPID + TCT 2025

April 8–10, Detroit, MI, USA
www.americamakes.us/events/trx-spring/

RAPID + TCT 2025

April 8–10, Detroit, MI, USA
www.rapid3devent.com

Space Tech Expo USA 2025

June 3–4, Long Beach, CA, USA
www.spacetecheexpo.com



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