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FonMag

READ AM I Application stories, interviews, news and insights about Additive Manufacturing

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The importance of AM in mechanical and plant engineering continues to grow

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In 3D Printing jewelry, Legor is going with the flow in its industry

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mesago

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Messe Frankfurt Group

Great things are done by a series of small things brought together.

Vincent van Gogh, Dutch painter and illustrator (1853–1890)

Even after nearly 40 years, the world of Additive Manufacturing remains one of the most complex industries. The plug-and-play solutions many have hoped for, however, have not yet gained traction in industrial environments. Instead, the space is dominated by individual solutions that are often quite complex themselves.

For midsize companies that lack specialized AM teams, it can be difficult to find the right system and manufacturer. This is where it helps to focus on specific applications. As the organization that puts on Formnext, we're also concentrating more and more on specific production solutions from different sectors.

Meanwhile, presenting solutions like these along the entire process chain at broadly focused trade fairs for Additive Manufacturing and the next generation of industrial production continues to constitute the core of the Formnext brand. A full 18 target groups come here to find and compare the products they'll use going forward.

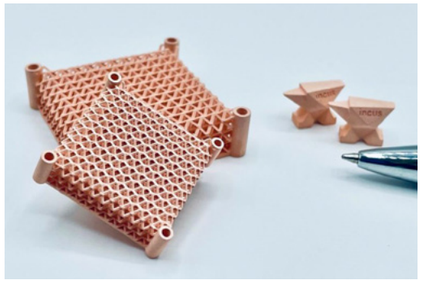
In addition, Formnext provides condensed information designed for numerous user industries, from special showcases to focus topics that change every year – with 2025 set to cover aerospace, plant and mechanical engineering, and jewelry and watches. These subjects can also be found in this year's presentation line-up, as well as in the background reports featured in this edition of our magazine (see pages 14 and 18), which is sure to draw new attendees. In contrast to narrowly focused events, Formnext enables you to share your thoughts with experts from a wide variety of industries, which can certainly lead to productive relationships and outstanding results.

Of course, there are plenty of advantages and synergies for exhibitors, as well. Thanks to our event, producers of AM systems, software, materials, and pre- and post-processing solutions don't need to stretch themselves across a series of single-subject fairs to meet with experts and users from many different sectors.

For the years ahead, we've set our sights on making even more of an effort to combine the benefits of our horizontal and vertical event concept. You'll already see the initial effects of this endeavor at Formnext 2025. Look forward to a few surprises, and if you see us, do say hello! We'd love to hear what's on your mind.

Ihr Sascha F. Wenzler
Vice President Formnext

Cover: Mesago / Marc Jacquemin



PIONEERING METAL POWDER SOLUTIONS FOR INDUSTRIAL AM

FOMAS Group offers high-performance powders, metallurgical expertise, and a commitment to innovation and sustainability

As Additive Manufacturing continues to transform industrial production, the demand for reliable, high-performance metal powders is growing rapidly. At the forefront of this development is FOMAS Group, an Italian multinational that has made a name for itself as a premium supplier of metal powders. These powders, which are currently marketed under the brand MIMETE®, are tailored specifically to the needs of AM technologies. Based in Biassono (near Milan), FOMAS Group established its powder production plant in 2017, opening up a new manufacturing line to complement the Group's already established manufacturing of forgings and rolled rings.

DECADES IN METALLURGY

The plant's foundation within FOMAS Group has brought with it decades of metallurgical expertise and deep knowledge of the materials used in demanding sectors such as energy, aerospace, oil and gas, and automotive. This heritage provides the company with a solid industrial backbone and the ability to ensure consistent quality, traceability, and scalability—key requirements for industrial Additive Manufacturing.

The company specializes in the production of metal powders using gas atomization, a process that results in spherical particles with excellent flowability, purity, and density. These characteristics have proven ideal for powder bed fusion, thermal spray coating, and other AM technologies. Along with a comprehensive range of high-quality materials featuring iron, nickel, and cobalt-based alloys, FOMAS Group offers bespoke solutions developed in close partnership with clients.

STRONG EMPHASIS ON QUALITY AND INNOVATION

One of FOMAS Group's distinguishing features is its strong emphasis on quality and innovation. The company operates a fully integrated production and quality control process that includes in-house laboratories for chemical, morphological, and metallurgical analysis. This enables it to strictly control every batch and ensure that its powders meet the highest standards required by critical industries.

As Additive Manufacturing evolves from prototyping to full industrial application, FOMAS Group is positioning itself as a reliable, forward-thinking partner that is helping to shape the future of advanced production.

FOMAS GROUP

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Images: FOMAS Group

FORMNEXT AWARDS – SETTING THE STAGE FOR AM PROGRESS

At Formnext 2024, a new, enhanced concept that awarded winners in six categories attracted a great deal of international attention. In 2025, Formnext will write the next chapter in this success story by once again presenting the Formnext Awards in six different categories, honoring, among other things, aspiring young companies, future-oriented sustainable business models, and cutting-edge technologies. Applications can be submitted until 31July for the Start-up Award and until August 31 August for all other categories:

- **AMbassador Award:** outstanding individuals or organizations that have had a unique impact on the industry and its users through innovative training, education, or personal advocacy
- **Design Award:** exceptional AM design and AM products (aesthetic and functional aspects)
- **(R)Evolution Award:** products, technologies, or services that are groundbreaking and offer particular added value to users
- **Rookie Award:** young individuals who have not yet founded a company or founded one less than a year ago with a promising business idea
- **Start-up Award:** young, inspiring companies with feasible business models
- **Sustainability Award:** AM applications and products that are assessed and evaluated based on their product life cycle

»To keep moving forward, the AM industry needs a constant supply of new and forward-looking ideas and innovators. So, we want to do more than just give outstanding people, companies, and organizations a stage. We also want to help them network and connect with potential customers, partners, and investors,« explains Christoph Stüker, Vice President Formnext.

+ FURTHER INFORMATION:
» formnext.com/awards

CALL FOR SPEAKERS FOR STAGE PROGRAM HAS OPENED

Having achieved international acclaim for its supporting program on three stages, Formnext is continuing its successful multistage concept in 2025. The call for speakers is now open.

Formnext is continuing to sharpen the thematic focus of the conference program this year by concentrating even more on topics as design for AM, new products and technologies, business cases, automation, AM services, occupational safety in AM, bioprinting, start-ups and funding, and sustainability.

On the Application Stage, experts and users will present exciting and forward-looking solutions from a range of industries organized into different application areas: from architecture and automation, through medical and dental technology, to the automotive industry, electronic engineering, and tool and die making. The thematic priorities will also be based on this year's Formnext focus topics: aviation and aerospace, jewelry and watches, and mechanical and plant engineering.

On the Industry Stage, entrepreneurs, experts, and industry representatives will discuss current overarching issues and aspects of the industry, such as sustainability and the industrialization of AM. Relevant topics also include start-ups, investment and funding, standards and qualifications as well as further training, skills and young talent

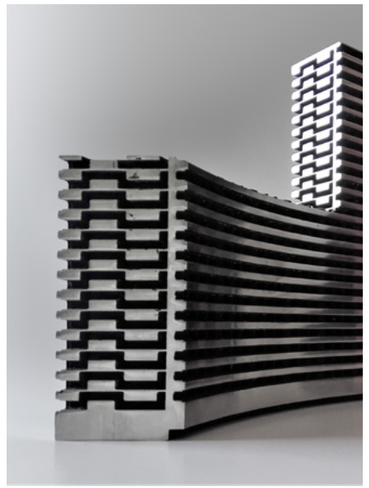
Interested Formnext exhibitors will be bringing their services and solutions to the Technology Stage. On each day of the show innovations from the fields along the AM process chain will be presented and discussed.

Do you have interesting insights for the AM community? Be a part of Formnext and our stage program. The Call for Speakers for the Industry Stage and Application Stage is open until the end of June.

+ FURTHER INFORMATION:
» formnext.com/callforspeakers

Images: Mesago / Marc Jacquemin

LABYRINTH CAGE FOR GAS PLANT



Fomas Group, in collaboration with 3D Energy (the owner of the component design), has developed a labyrinth cage for a high-temperature gas valve for an African gas plant. The project partners came up with the solution based on Additive Manufacturing to overcome some of the previous challenges at the power plant, which included long delivery times, high costs, and limited technical support from the original equipment manufacturer (OEM). These factors jeopardized the availability of critical spare parts the plant requires for continuous operation.

One key objective was to reduce delivery times in order to meet a scheduled maintenance date in 12 weeks.

The project used a specific metal powder made of Inconel 718, which is produced by Fomas Group: Mimete V 718, a nickel-based alloy that, according to Fomas, has very good properties in high-temperature environments.

Production was closely monitored throughout the development chain, from initial design to printing and quality testing. In the end, the labyrinth cage was produced in just eight weeks, including the design, prototyping, and testing phases. Fomas reports that the costs were also reduced by 16 percent compared to the conventional part.

AUTOMATION AND NETWORKING OF THE POST-PROCESSING CHAIN

The publicly funded joint project wiseON is qualifying a digitized SLS production line for the economical use of Additive Manufacturing in industrial series applications. The partners involved are Neue Materialien Bayreuth, Rehau Industries, Toolcraft, Ossberger, and Rösler Oberflächentechnik.

Selective laser sintering (SLS) enables the efficient production of high-quality plastic components in large quantities. In addition to the actual printing process, however, downstream steps such as coarse de-powdering and surface finishing are crucial to component quality. Until now, these steps have often been carried out manually, which increases costs, limits reproducibility, and makes industrial use more difficult.

To reduce costs and the time required for component production while increasing quality, the partners in wiseON are investigating the automation and networking of the entire post-processing chain. Inline quality assurance systems are also being integrated. The collection and networking of relevant machine data is to result in a comprehensive process analysis that reveals optimization potential and makes Additive Manufacturing more efficient.

In particular, the project is focusing on the reusability of powder, which is a key factor in sustainable and cost-efficient production. Various SLS powders are therefore being examined to evaluate their processability after repeated recycling. Critical material properties such as particle size distribution and flowability are being continuously measured and analyzed with regard to their impact on the printing process.

Image: Fomas Group

TECHNICAL DRAWING ANALYSIS, POWERED BY AI

3Yourmind has released Technical Drawing Analysis, a new AI-powered feature offered within its Part Identification software. Designed to accelerate spare part digitization, the software can analyze 2D technical drawings up to 200 times faster than manual methods according to the Berlin-based company. The solution is now ITAR-compliant and available through secure cloud hosting.

»In many industries, technical drawings remain the primary reference for manufacturing spare parts,« says Stephan Galozy, chief product officer at 3Yourmind. »By streamlining this otherwise manually intensive process, we're helping to accelerate the next step: creating the 3D file. Our long-term vision for this functionality is text-to-3D.« Technical Drawing Analysis extracts and interprets data across various formats and layouts using optical character recognition (OCR) and large language models (LLMs) to extract and analyze metadata from title blocks, drawing notes, and annotations. The software then uses this information to evaluate spare part manufacturability and determine whether parts can be produced using standard manufacturing methods.

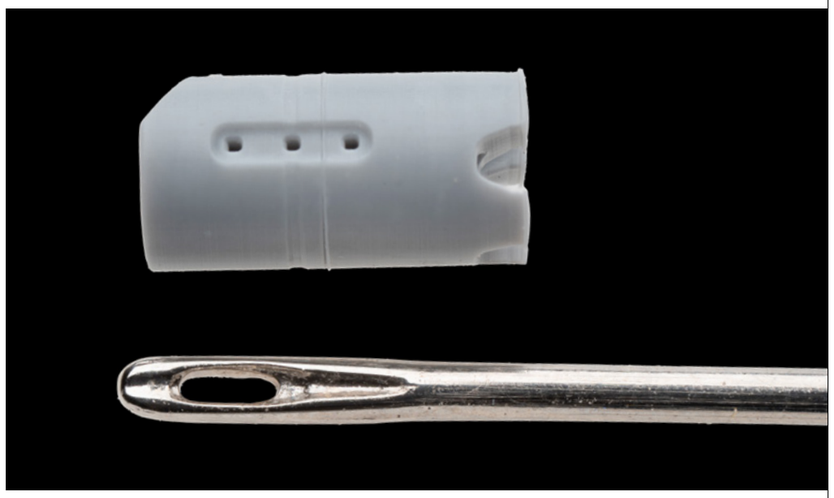
FROM PRECISION PROTOTYPES TO SCALED-DOWN PRODUCTION

Text: James Woodcock

Once hyped alongside nanotech and MEMS, Micro-AM is now bridging design innovation with manufacturability in real-world applications.

Micro 3D Printing, which is to say 3D Printing parts with features between 1µm and 1000µm, is advancing rapidly driven by wider miniaturization trends in medtech, electronics, biotech, and optics. As devices shrink to become wearable or less invasive, so too must components like connectors, housings, and microfluidic chips. Once hyped alongside nanotech and MEMS, Micro-AM is now bridging design innovation with manufacturability in real-world applications.

In many ways, the experience of making micro-scale parts through 3D Printing processes mirrors that of the macro world. The technologies themselves, while highly specialized, are mostly analogous to macro systems, ditto the materials and finishing processes. And the ongoing journey from prototyping / short-run manufacturing through to serial production is shared. But there are important technological considerations for the manufacture of tiny parts.



Opposite page:
An endoscope tip printed on B9Creations Elite series 3D printers, with sewing needle for scale.

Images: B9Creations, Incus, Nanoscribe

TECHNOLOGY OVERVIEW

A range of technologies are available for fabricating microscale parts from polymers, ceramics, metals, and even biological materials. Some reach into nanoscale feature sizes, connecting the micro and nano-manufacturing domains.

Two-Photon Polymerization (2PP) uses a femtosecond laser to induce localized polymerization within a photosensitive resin. By converging two photons, 2PP surpasses the diffraction limit of light (roughly 500nm/0.5µm for visible light), enabling true 3D structures with features below 1µm. Systems like Nanoscribe's Photonic Professional, UpNano's NanoOne, and Microlight3D's microFAB-3D use this method.

Projection Micro-Stereolithography (PµSL) applies DLP or LCD-based resin curing, projecting UV images with high-resolution optics to achieve pixel sizes as small as 2–10µm. Boston Micro Fabrication is a leader in this space.

Micro Laser Sintering/Melting adapts powder-bed fusion (PBF) with finer metal powders (5–10µm particles vs 15–50µm for macro LBPF) and smaller laser spots (~30µm vs 80–100µm for macro systems) to produce metal micro-parts. Providers like Trumpf and EOS (via 3DMicroPrint GmbH) offer systems specifically designed for this purpose.

Lithography-based Metal Manufacturing (LMM) builds upon the principles of stereolithography (SLA), using a photo-reactive resin loaded with fine metal powder. During the printing process, a light source selectively cures the resin layer by layer to create a »green part«. This is followed by thermal debinding and sintering, which remove the polymer binder and fuse the metal particles into a dense, fully metallic component. Incus3D provides platforms based on this technology.

Micro Inkjet and Aerosol Jet Printing deposit minuscule volumes of materials, ideal for fine conductive traces or small 2.5D structures. This method straddles 3D Printing and electronics manufacturing and the nature of these systems means they can be applied to bioprinting of living cells and structures. Vendors like nScrypt and Optomec offer commercial and research systems.

Femtosecond Laser Processing in Glass uses ultrafast lasers to create structures inside transparent materials. Though technically subtractive (involving etching after laser modification), it's often considered in the same context as additive microfabrication. Companies like LightFab, Femtoprint, and 3D-Micromac lead here.

Direct Electrochemical Deposition—used by systems such as Exaddon's—builds metal microstructures without powders or lasers. This electroplating AM method is notable for simplicity and precision.

MICRO TECHNOLOGY IS AN ECOSYSTEM

Material performance at the microscale can diverge significantly from the same material's macro-scale properties. This shift is driven by surface-area-to-volume ratios, thermal behavior, and curing dynamics. Mechanical properties may change, making testing at the application scale essential.

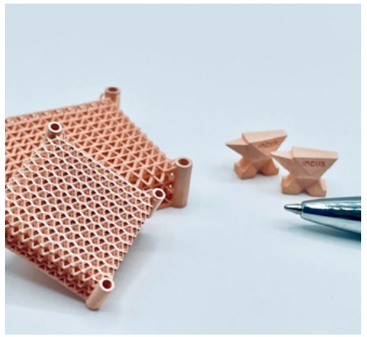
3D Creations, for example, supports both in-house and third-party resins (including BASF and Loctite), but places strong emphasis on custom materials formulated for micro applications. Its recently released flame-retardant resin self-extinguishes in under 10 seconds and is already in industrial use.

Flame-retardant and biocompatible materials are increasingly in demand. In electronics, TE Connectivity has helped drive development of proprietary FR resins compatible with Boston Microfabrications' PµSL processes. In medtech, biocompatible resins support tools for minimally invasive surgery, microneedles, and surgical guides. Micro 3D Printing is also a natural fit for wearables and micro-optical components.

SCALING UP FROM PROTOTYPE TO PRODUCTION

Micro-AM shares some fundamentals with conventional 3D Printing, but production brings unique challenges. While prototyping may use off-the-shelf solutions, scaling to production—especially in regulated sectors—requires extensive collaboration with equipment vendors, benchmarking, and process validation.

Unlike plug-and-play desktop systems, micro-AM tools often demand expert handling. To address this, vendors now offer dual-mode systems—preset configurations for general users and full-access interfaces for engineers. These systems are increasingly paired with consultative support, including »



99.9% pure copper material printed on Incus GmbH's LMM technology. Nanoscribe's IPX-Clear material for highly transparent microoptics is compatible with its 2GL technology and 2PP.

benchmarking, print services, and process optimization.

One ongoing challenge is post-processing. Geometry directly impacts the ease of support removal, cleaning, and finishing. Design for Additive Manufacturing (DfAM) is becoming more nuanced as engineers optimize parts for both printability and post-printing.

TOWARD SCALABLE, FUNCTIONAL MICRO PARTS

Micro-AM's next wave of growth hinges on reliability, throughput, and advanced materials. As micro parts become central to high-tech product development, the technology is evolving from niche application to standard tool. While it may not fully replace traditional microfabrication yet, it is gaining ground for functional prototypes, low-volume runs, and innovation-driven manufacturing.

Numerous exhibits on various stands at Formnext 2024 also highlighted the significance of Micro 3D Printing.

Smaller parts often mean tighter tolerances, novel materials, and higher expectations for performance, making Micro 3D Printing an increasingly essential technology in cutting-edge R&D and product development. The smaller the part, the greater the opportunity.

+ FURTHER INFORMATION:
» formnext.com/fonmag

Images: Fraunhofer IGCV, Mesago / Marc Jacquemin

THE EXHIBITION FLOOR AS A CAREER TOOL

Formnext offers a wide range of opportunities for young talents and companies looking for personnel – with Career Day and more

Text: Thomas Masuch

Every year at Formnext, Samia Boutari can sense that the world of Additive Manufacturing is still attractive for young people. Here, the senior consultant and coach at the Cologne-based personnel and management consultancy proJob – which has been a cooperation partner of Formnext's Career Day in Frankfurt for 10 years – experiences the entire spectrum of the personnel market.

The profiles of candidates interested in jobs in the world of Additive Manufacturing are very diverse. Younger people come to Formnext for career advice: a young man who has just graduated from high school and is looking for career guidance, for example, or a career changer who studied electrical engineering and now wants to know what qualifications they can use to enter the world of AM.

Samia Boutari has been handling Formnext's Career Day for 10 years and also offers one-on-one advice at the event.

»On the other hand, as in other sectors, there are very well-trained candidates from countries such as Mexico or India who are interested in how they can gain a professional foothold in Germany,« explains Boutari. »It's very interesting to see when these highly motivated people meet the less hungry younger generation in this country and compete with them.« In Boutari's experience, many graduates from German universities still approach the application process with a high sense of entitlement and demands and first ask what the general conditions are like in the company in question. However, this is slowly changing; companies still have to fill new positions, but not as many and not as urgently as two years ago. »There are also many highly motivated and excellent specialists in Germany, but the pressure from outside – meaning from highly motivated international applicants – is definitely increasing,« Boutari reports.

Despite all this, she still sees the AM world as an interesting market for committed candidates – including both those with relevant qualifications and those moving into a new field.

FEWER NEW HIRES

The HR experts at Alexander Daniels Global have also noticed a change in the job market in the AM sector. It relates to »

Images: Mesago / Marc Jacquemin

the development of available positions and salaries, both of which reflect the challenging market situation. According to the latest Salary Report from Alexander Daniels Global, the number of new hires in the AM industry has fallen significantly worldwide: by 14 percent in North America and by 21 percent in the EMEA region. At the same time, more and more employees in the AM world are open to new positions. »Nevertheless, the demand for certain qualifications remains high,« explains Sophie Pontoppidan, growth marketing manager at Alexander Daniels Global. In particular, qualified operators and technicians have good opportunities on the AM job market.

»NOT A ONE-WAY STREET«

Nevertheless, companies still have to do a lot to attract good employees. »The whole issue of personnel is still not a one-way street,« explains Boutari. Formnext, which provides intensive support for recruiting young talent with its Career Day, is a very good opportunity for this. While some interested parties register four to six weeks before Formnext, many consultations are also arranged spontaneously at the trade fair. »When we start at 10:00 am on Career Day, all our slots for consultations are fully booked by 10:30 am,« Boutari reveals. The job wall, which features printed job advertisements, also continues to be a real crowd magnet at Formnext.

In addition, Formnext offers job-seekers a wide range of opportunities to make contacts outside of Career Day, as many companies would be delighted to hear of any interest. »You don't necessarily have to focus on the market leaders,« Boutari points out. »It's also worth looking at smaller companies, even if they don't have any vacancies advertised.« However, it is important to present yourself appropriately as a student or young professional; that includes suitable clothing, a CV in your pocket, and a list of companies you want to get to know.

Career Day at Formnext 2025
The Formnext Career Day will take place on Friday, 21 November 2025. Here, the HR experts from proJob will be available for consultations. Applicants can also have professional portrait photos taken free of charge. Throughout the year, companies have the opportunity to use the Formnext career portal to fill vacancies. Their job advertisements are also presented in printed form on the job wall at Formnext.

Images:
The tried-and-true job wall remains a magnet for potential employees at Formnext. Meanwhile, Career Day offers professional photo shoots and much more besides.

EMPLOYER BRANDING AT THE TRADE FAIR

Boutari has found that not all companies take advantage of the opportunity to recruit staff at trade fairs. »Even if companies are primarily thinking about business and sales at these events, every trade fair appearance is always a kind of employer branding. Unfortunately, this awareness is often lacking.« As a result, candidates looking for a job are often turned away at trade fair booths and advised to use the company website for applications. »This even happens with companies that are actively looking for staff,« says Boutari.

She sees the reason for this in the fact that the typical trade fair booth is largely staffed by sales people whose main interest is in generating leads. The problem could be solved quite easily without having to have a member of HR staff at the booth all day. »You could reserve two slots at the Formnext Career Day in particular, where a recruiter is connected via an online meeting.« A suitably trained host would also be capable of taking down information, answering a few questions, and thus helping their company make a good impression.

Two years ago at Formnext, Boutari experienced just how important this impression is and that it can ultimately be relevant for business. »A medical doctor from Italy came to us who was interested in an AM system, but also wanted to find out whether he might be able to make a career change,« she recalls. However, the doctor made the »mistake« of first approaching the booth of a printer manufacturer to discuss careers, whereupon he was turned away with a reference to the company website. As a result, he never even asked about a possible printer purchase – but did inquire with a different company.

A detailed interview with Sophie Pontoppidan, growth marketing manager at Alexander Daniels Global, on the current personnel trends in Additive Manufacturing can be found online in our E-Mag.

+ FURTHER INFORMATION:
» formnext.com/fonmag

THE EFFICIENT PROBLEM SOLVERS

In mechanical and plant engineering, Additive Manufacturing is becoming increasingly crucial for innovation and performance – and often at a fairly manageable investment.

Text: Thomas Masuch

3D-printed gears that hold workpieces in BMF's Twister system.

Ronny Bernstein has been fully integrating 3D Printing into the growth strategy of Bernstein Mechanische Fertigung (BMF) – a medium-sized system supplier for post-processing – for many years. The innovative Saxon is one of Germany's pioneers, particularly in the highly conventional mechanical and plant engineering sector. His company produces around 50,000 parts per year on its 14 3D printers, some of which are also used for the production of the Twister, a surface treatment system. This means BMF also makes use of AM itself.

CLOSELY INTERLINKED

The close intertwining of mechanical and plant engineering with Additive Manufacturing is also emphasized by Rainer Gebhardt, project manager of the AM working group within the German mechanical engineering association VDMA. »AM is first and foremost mechanical engineering, and at the same time, there's great potential for the use of AM in mechanical engineering,« he affirms.

Generally speaking, however, turnover from AM currently only plays a minor role compared to mechanical engineering: While mechanical and plant engineering companies in the EU alone generated turnover of €910 billion in 2024, turnover from the sale and servicing of AM systems amounted to just around €5 billion according to the latest Wohlers Report – and that's all around the world. When listing the most important AM user industries, mechanical and plant engineering is not at the top of the list; in market studies on Additive Manufacturing, the industry is sometimes not included at all, or only marginally. In the current Ampower report, the sector is included in the »Industrial« user segment, which accounted for 11.6 percent of AM system sales in 2024.

A more concrete indication of the importance of Additive Manufacturing in mechanical and plant engineering is provided by the VDMA's AM working group, which has over 200 members (around half of which are manufacturers of machines and systems, with suppliers of AM systems, materials, software, or services making up the rest). This puts the group, which was established in 2014, on a par with some of the VDMA's 32 trade associations and their 3,500 member companies. This is a clear signal that the young technology is being taken seriously by traditional mechanical engineering companies.

MODEST TURNOVER, BUT CONSIDERABLE IMPACT

The often widespread »dilemma« of Additive Manufacturing is particularly evident in mechanical and plant engineering: In terms of turnover, 3D Printing plays a very small role, but it ensures that innovations are possible and machines are becoming more advanced, which results in a fairly large (and not always measurable) added economic value overall. AM is also increasingly becoming a decisive factor in improving the performance of production systems. »In relation to overall systems, a comparatively modest number of small 3D-printed components often ensure that the performance of a large system, sometimes costing many millions of euros, is significantly improved,« Rainer Gebhardt explains. Examples of this include special grippers, heat exchangers, or tools with conformal cooling.

The 3D Printing service provider Protiq also manufactures a wide range of different components for mechanical and plant engineering. These include functionally integrated metal components, assembly-friendly special solutions, and highly specialized plastic parts for technical devices. »In mechanical and plant engineering, every gram and every second of assembly time often counts. We're therefore increasingly realizing components that would consist of several individual components in conventional processes and would first have to be laboriously adapted to the individual machine in question,« explains Stefan de Groot, sales manager at Protiq. 3D Printing also demonstrates its advantages when it comes to robust guides, complex devices, or individually designed components for test benches, for example, which can be designed more efficiently and flexibly using AM.

It is therefore hardly surprising that Rainer Gebhardt also ascribes an extremely important role to Additive Manufacturing in mechanical and plant engineering. »Especially with regard to industrial production and the factory of the future, Additive Manufacturing is very important in combination with traditional mechanical and plant engineering. After all, simply putting an AM machine on a greenfield site hardly makes sense in the vast majority of cases,« he points out. Major machine manufacturers such as DMG Mori, Trumpf, and Arburg build AM systems that meet all the standards of industrial production in terms of interfaces, sensors, quality, and reliability.

CONFIDENT MARKET FORECAST

At the same time, Gebhardt is convinced that the mechanical and plant engineering sector has sufficient volume and potential for companies specializing in AM to grow in the long term. This is also backed up by Ampower's figures: While the sector's sales volume has hardly changed in the past three years, the Hamburg-based market analysts »

Portrait:
Rainer Gebhardt.
At right:
This 3D-printed robotic gripper, which was custom-developed by Protiq, is designed to handle injection-molded plastic components and packaging materials.

Images: BMF (2), Protiq, VDMA

expect average annual growth of 13% over the next five years, which is slightly higher than the forecast for the AM market as a whole. Ampower managing director Matthias Schmidt-Lehr attributes this positive development to increasingly affordable AM systems, among other things: »This is a strong trend. PBF systems in metal and polymer are now available for less than €50,000, not to mention from manufacturers such as Bambulabs. This makes it easier for medium-sized companies for whom large investments in AM systems were often not an option in the past to get started with Additive Manufacturing. In addition, the 3D Printing of production equipment is becoming more and more widespread, partly due to the tireless work of many resellers.«

Ronny Bernstein is also seeing significant growth in 3D Printing in mechanical and plant engineering, »and significantly more than in the rest of the market«. Among other reasons, he cites the way that designs are changing with a new generation of employees, resulting in more applications. In addition, the number of users is continuously increasing. Although 3D Printing remains a niche in the industry, »the companies that have identified a sensible application are using 3D Printing and earning money with it,« Bernstein reveals.

SOME CHALLENGES REMAIN

Nevertheless, mechanical and plant engineering still has some challenges to contend with. The industry is rather conservative, and according to Rainer Gebhardt, »the margins are not particularly high – it's not comparable to medicine or aircraft construction.«. This is why manufacturers of conventional machines are also approaching Additive Manufacturing rather cautiously. »In difficult economic times, the willingness to try out something new is also often limited,« Gebhardt adds.

The particular challenge for companies in the mechanical and plant engineering sector is that although Additive Manufacturing can significantly improve their own products, »you don't automatically get paid for it,« Gebhardt says. »Customers are happy about faster machine set-up times, for example, but also say that they don't necessarily want to spend more money because of it.« However, as more and more manufacturers in the industry turn their attention to AM and advance their machines' technology, there is hardly any way around Additive Manufacturing for those who want to remain competitive in the future.

FOCUS ON EFFICIENCY

As a solution to this challenge, an approach seems to have established itself in mechanical engineering that makes the most efficient use of relatively manageable investments and develops practicable manufacturing solutions in order to achieve results that lead to a noticeable difference.

Additive Manufacturing has also led to many innovations in the field of tools. Tools (or tool inserts) with conformal cooling are a typical example here. These are generally somewhat more expensive than »normal« tools, but can significantly increase the performance of an expensive injection molding machine, as Gebhardt explains. There can be improvements in the quality of manufactured products, as well. The French company Addup, which has been operating its Tooling Competence Center on the campus of RWTH Aachen University since 2023, has shown that this area is also attractive for manufacturers of AM systems.

PROGRESS IN STANDARDIZATION

The development of the AM sector in mechanical and plant engineering is also reflected by the fact that standardization in the field of AM is slowly picking up speed. According to Gebhardt, this topic has been one of the most important challenges for many years. »Some companies have developed really good components with AM, but were unable to use them because no AM standard existed.« Although this has not yet changed completely, efforts are being made to develop industry-specific standards. Examples of this are the EU's Pressure Equipment Directive and the VDMA's product category rule 34178:2025-04, which is for determining the carbon footprint of machine tools and machines for Additive Manufacturing.

You can find out how companies like BMF and Protiq are succeeding using 3D Printing in versatile ways in exclusive background reports online in our E-Mag.

+ FURTHER INFORMATION:
» formnext.com/fonmag
» vdma.org/additive-manufacturing

3D-printed spare parts for BMF's Twister.

FROM ADDITIVE MANUFACTURING TO RAPID TOOLING

Having amassed a wealth of experience in AM over the past three decades, the family-run company cirp now boasts an impressive breadth of technologies and expertise.

Cirp is a leading provider of 3D Printing services in southern Germany that celebrated its 30th anniversary in 2024. Since its foundation, it has considered itself a partner for plastic components starting from a batch size of one with a dedication to Additive Manufacturing, rapid tooling, and injection molding. Indeed, the company's machine park now comprises more than 25 industrial AM systems, including SLA, polyjet, SLS, and FDM installations with varying build spaces and a broad range of supported materials. The various technologies it works with are one of the main reasons why cirp attaches a great deal of importance to offering tailored guidance. This enables customers to benefit from the decades of experience its 70 employees can bring to bear.

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Images: cirp GmbH

In cases involving special material requirements or quantities anywhere between 50 and 10,000, for example, injection molding is often the better, more reliable option. Here, cirp has established its own process chain with highly standardized workflows and solutions. Its seven modern, fully electric injection-molding machines are capable of up to 450 tons of clamping force, and each has its own dedicated master mould. This means cirp only needs to manufacture tool inserts for specific customers and components. From tool design and programming all the way to the processing of high-strength aluminum on four machining centers with three or five axes, the entire process takes place under the same roof. This enables cirp to proceed from an initial order to a first batch of standard-material components in record time – two to three weeks in most cases. If a project is super urgent, the company can even provide assistance within a week.

BROAD CUSTOMER BASE

cirp supplies a wide variety of industries. In the greater Stuttgart area, a particular focus is on the automotive industry and related suppliers. Over the decades, cirp has grown continuously to meet their requirements and now supplies numerous other sectors such as mechanical engineering, robotics, capital goods, electronics, household appliances, battery technology, aviation, two-wheelers, medical technology, architecture, and furniture. At the same time, cirp's broad base of clients ranges from start-ups and freelance designers to numerous midsized companies and well-known DAX corporations.

The team at cirp also enjoys receiving more exotic inquiries involving things like museum exhibits or trophies for special competitions. Challenges like these typically require more than expertise in manufacturing and materials: Data specialists need to process scanned information, provide support in production-oriented design, and serve as helpful »sparring partners« in discussions with customers. Finally, cirp places special emphasis on the careful finishing of additively manufactured parts. Grinding, polishing, dyeing, painting, and assembly are required for a large portion of its projects. Transparent components – which happen to be one of cirp's greatest strengths – have to meet particularly high standards in this regard.

PUSHING THE ENVELOPE IN AM

At cirp's headquarters in Heimsheim, no one is ever satisfied with the current state of the art. The company's in-house research team is always immersing itself in innovations and actively seeking to push the boundaries of processes, materials, and applications in AM.
For proof of its regular participation in funded research collaborations, one need look no further than the exhibits cirp brings to Formnext every year: Custom software for lattice generation, an SLS and powder management process based on Industry 4.0, artificial organs for surgical training, 3D-printed free-form lenses, and much more amaze and inspire vistors.

RESPONDING TO CHANGES IN A NOBLE NICHE

The world of jewelry is a delicate and demanding user industry in which Additive Manufacturing is increasingly gaining a foothold. One reason for this is the trend towards greater flexibility and smaller quantities. One important player that is making AM accessible to more and more jewelry designers and manufacturers is the Italian company Legor.

Text: Thomas Masuch

In 2022, Legor began its journey into Additive Manufacturing with a collaboration with HP. »In this project, our mission is to bring innovation to life through 3D metal jet printing technology and advanced metal production services. We see ourselves not just as providers of technology, but as catalysts for creativity and transformation. Our role is to bridge the gap between technical excellence and artistic vision and help designers and product developers turn their ideas into extraordinary, personalized metal creations that are ready for the market,« says Fabio Di Falco, marketing manager at Legor Group. At the same time, the consideration that the jewelry industry is changing and moving towards more flexibility has also played a role.

Legor is an Italian family business that specializes in transforming metals into high-quality alloys, plating solutions, and powders for the production of jewelry and fashion accessories. Headquartered in Bressanvido, near the city of Vicenza – Italy's renowned capital of goldsmithing – the company now has 200 employees and nine branches around the globe. It says that 40% of the jewelry produced worldwide is made using Legor alloys, and 14% of jewelry and fashion accessories are plated with Legor solutions. »With our products, we are at the beginning of the manufacturing chain in the jewelry industry and are therefore a very important player,« Di Falco states.

UP TO A THOUSAND PARTS PER WEEK

From a technological point of view, Legor decided early on to make use of binder jetting technology. The company had also looked into selective laser sintering (SLM), but: »Binder jetting technology is simply the best choice for our strategy. It enables industrial scalability, cost reduction, and the production of complex, high-precision metal components in large volumes. This technology is capable of adapting to both small series or special-edition productions, as well as to large-scale manufacturing.« Di Falco also sees the technological advancement of binder jetting technology as the reason why Additive Manufacturing has become more influential »

Cover:
Iconic organic necklace: A jewelry piece by Julia Körner that demonstrates the power of implicit modeling in assuring aesthetic design, individuality, and manufacturability.

Below:
Legor's headquarters in Bressanvido
At right:
Fabio di Falco

Images: Legor, Mesago/Marc Jacquemin

At right:
Various pieces of jewelry that have been manufactured at Legor.
Below:
Four employees run Legor's 3D Printing department in Bressanvido, producing up to a thousand parts per week.

in the jewelry industry in recent years. »A long time ago, precious metals were processed using SLM technology, but SLM often requires support structures that lead to more expensive waste, and the surface quality was also unsatisfactory.«

Thanks to its agreement with HP, Legor says it is not only the sole company in Italy that is operating HP binder jetting systems; it has also developed a great deal of expertise in the adoption of the techonology in the jewelry and fashion accessories industries. »We've made significant progress in the past three years,« Di Falco reveals. Legor now has its own 3D Printing department in Bressanvido, which is operated by four employees and can produce up to 1,000 parts per week on printers from both HP and Desktop Metal. These are also used to process four different metals: bronze, stainless steel, platinum, and a patented silver alloy. The 3D Printing of gold is also already under development.

»We currently print platinum parts using the Desktop Metal printer, as its smaller size requires a lower quantity of precious metal powder to operate, making the process more cost-effective and reducing material waste. For printing silver parts, on the other hand, we use the HP printer, which is larger and better suited to handling less expensive materials in higher volumes.«

QUICKLY EXPERIENCED THE LEARNING CURVE

With its equipment and extensive knowledge, Legor has not only developed its own metal powders (its Powmet line) for the 3D Printing of jewelry. It also acts as a service provider, primarily for manufacturers and designers. According to Di Falco, it has achieved a level of quality that is »accepted by the industry«.

Binder Jetting:
For further information on this procedure, check out the AM Field Guide at:
formnext.com/amfieldguide

In quality assurance, Legor checks its components for dimensional accuracy and density (»we achieve up to 99.9 percent«), and strives for the best possible surface quality in cooperation with external partners (e.g. for sandblasting). »However, some customers prefer to grind or polish their jewelry themselves,« Di Falco points out.

As a service provider, Legor has also experienced the relatively recent learning curve of Additive Manufacturing in the jewelry industry. »Initially, we were approached by companies that often wanted to 3D-print their existing products and designs,« recalls Di Falco. »In total, we printed more than 1,000 designs, but not all the objects were useful because traditional designs are easier to produce using conventional methods.« Ultimately, however, this process also helped many players in different industries to better understand the possibilities of Additive Manufacturing.

INQUIRIES BECOMING MORE MATURE

In the meantime, the requests from the jewelry world have also become more »mature« and the »companies have understood that AM can revolutionize the jewelry sector«. Legor is now receiving designs that would be very difficult or impossible to produce using conventional technologies. »Designers and smaller companies can use it to realize their special designs without having to invest in more expensive molds,« Di Falco explains. Other larger companies sometimes order several hundred products because they need them quickly for an exhibition or a special collection.

Finally, Legor is also involved in a collaboration with the Istituto Europeo di Design in Milan so that even more jewelry designers can use Additive Manufacturing in the future. Fabio Di Falco is certain that related expertise will be even more important going forward.

»The industry is changing: We're seeing less and less mass production with hundreds of thousands of pieces. The trend is towards more flexibility, mass customization, smaller quantities, and more unusual designs.«

Further background information on the development of 3D Printing in the jewelry market, as well as other additive applications in the luxury goods sector, can be found online in our E-Mag.

+ FURTHER INFORMATION:
» formnext.com/fonmag

At right:
Designed by AnalogLab and brought to life through the collaboration with Legor and HP, Amano+ aims to redefine watchmaking.

Above:
The company's product portfolio ranges from Additive Manufacturing to solutions for surface-finishing fashion accessories.

SELF-SUFFICIENT, BUT NOT ALONE

Illustration: feedbackmedia.de, iStock/Denis Lytiagin, drogatnev

Text: Thomas Masuch

What do 3D printers and recreational vehicles have in common? At first glance, not much: One hums along in a basement or factory, while the other calls campsites home. Look a bit closer, however, and you'll see some parallels. Both industries are more or less the same size, and both have faced the same economic challenges in recent years. Most importantly, both satisfy a certain desire for independence and individuality.

3D Printing offers the promise of decentralized, self-sufficient production, and RVs are synonymous with the freedom to roam. Both give you complete control over your objective, be it a particular workpiece or a geographic destination. Both enjoyed a boom due to COVID-19, as well: In Additive Manufacturing, this was reflected mainly in share prices that touched dizzying heights for a time. Meanwhile, RVs were sold out for months, which also drove demand for their manufacturers' stocks. Then, both upswings were followed by periods of what the business world euphemistically refers to as »market consolidation«. In other words, the euphoria gave way to a dose of reality.

The ideas at the heart of these two innovations will endure, though. According to the latest Wohlers Report, the AM market should average an annual growth rate of 18 percent for the next 10 years, swelling from US$21.9 billion in 2024 to US$115 billion in 2034. The RV business is expected to see strong growth in the years ahead as well, with annual estimates ranging between 4.2 and 11.5 percent. It appears that the dream of independent production and the freedom to travel lives on – even if it is evolving at the moment.

Anyone who thinks that we might reach the point of too much individualism sometime in the future need not worry: Japan is already working on it. In 2021, it established a »Ministry of Loneliness« – a governmental agency tasked with addressing social isolation and developing programs to combat seclusion.

We can all hope that in spite of all our efforts to achieve independence, we'll never forget to knock on our neighbors' doors now and then, whether it's in a makerspace, on the factory floor, or at a campsite. Or even better: We can meet with like-minded people or entire communities in the same place – at Formnext, for instance!

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THE SKY'S NO LIMIT

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Additive Manufacturing (AM) holds major benefits for the aviation and aerospace manufacturing industry

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