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by **formnext**

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## EDITORIAL

For nearly a year, our computer screens more or less shaped our view of the world and served as the window through which we could still get in touch with other people. This summer, however, the importance of the monitor has diminished somewhat, at least for much of Europe. Travel is once again possible, which is opening the door to many more in-person interactions.

We're among those who have taken the opportunity to meet up with various key contacts. To get to know our partner country for 2021 and its AM landscape a bit better, Thomas Masuch – the twice-vaccinated editor-in-chief of our Formnext magazine – paid a visit to numerous companies in Italy this past July. Besides reporting back to us with his exciting impressions of specific Italian firms in the AM industry, he also regaled us with stories of inspiring places and encounters.

The companies and employees Thomas met in Piedmont, Lombardy, Friuli, and Trentino went to great lengths to give him a warm welcome, as did a number of private hosts who were thrilled to have guests again following the lean times caused by the pandemic. In some places, our correspondent described feeling like he was part of the family, if only for a short time.

At first, we had our doubts as to whether a long trip like this would be worth the effort considering how we'd all become fully digitalized experts at working from home. Couldn't we just visit companies and conduct interviews for the magazine over the internet, as well? Thomas had barely gotten started out on his journey before we were reminded that there's just no substitute for real

human interactions and the chance to get a feel for other places in person. Especially when you're talking about Italy!

Lasting impressions, electrifying companies, inspiring personal interactions, and the sense of belonging to one big famiglia are just a few of the highlights you can look forward to once again at this year's Formnext. Our event team and more than 450 exhibitors are already fully engaged in their preparations to take you on an international tour of the world of AM from 16–19 November in Frankfurt.

Things won't be all the way back to normal at Formnext 2021, of course: We'll be taking all the necessary precautionary measures to keep you safe and healthy in line with the current situation and the related legal requirements.

Depending on where you're from and how long it takes to get to Germany, you may face some hurdles on your travels, as well. Still, opportunities to forge ahead, make valuable new contacts, and find new sources of information for your business are opening up again, and I'd say it's about time.

Sincerely, Sascha F. Wenzler  
Vice President Formnext



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**SAVE YOUR DATES**

# FORMNEXT NEWS

**FORMNEXT FRANKFURT / MAIN**  
 16 – 19 November 2021

**PRE-HEAT-EVENT**  
 20 & 21 October 2021

**DIGITAL DAYS**  
 30 Nov. & 1 Dec. 2021

Be part of it!  
**CALL FOR SPEAKERS**

## AM LIVE AND IN COLOR: FORMNEXT 2021 TO BE HELD AS ON-SITE PHYSICAL EVENT IN FRANKFURT

Following almost two years of almost entirely digital encounters, whether it be creative exchanges, product demonstrations or meetings, the team in Frankfurt and the AM community are eagerly waiting to get back into the halls in Frankfurt so their 3D-printing ideas can take shape in an effective and creative way.

In discussions with members of the community over the last couple of years, the Formnext team has once again come to realize the significance of Formnext. »This fair has an exuberance and spirit of innovation that is unbeatable. Just knowing that we can again offer this type of creative space where people can talk face-to-face, enjoy productive chats over coffee, touch products and discuss their progress embraced by the support of the whole community is wonderful«, commented Sascha F. Wenzler, Vice President of Formnext at Mesago Messe Frankfurt GmbH.

Preparations are full steam ahead for Formnext 2021 and the event is shaping up to be an unmissable one. Highlights are to include

high-caliber talks by industry experts, the presentations from Italy as the partner country, the innovations from the purmundus challenge, and Start-up Challenge Pitch-Next Event as well as the TCT Conference and Stage plus VDMA's and BE-AM's (Built Environment) special areas. Moreover ASTM (American Society for Testing and Materials) organizes as a premiere an international standards workshop on the day before Formnext starts. The Formnext team is going all out to make this first event after a year of not meeting physically one to remember.

Formnext will, as ever, be frequented by the majority of the most significant companies in the industry. Around 450 exhibitors, including 55% from abroad, have already registered as of mid-August.

Whilst there is clearly a lot to look forward to, the health and safety of all attendees remains paramount. The protection and hygiene concept, which was developed last year to comply with, and even exceed, the legal requirements, is therefore continuously being adapted to the pandemic situation. Wider aisles in the halls, as well as additional communication and waiting areas in higher frequented zones at the event will help people maintain the necessary social distancing. A 3G concept will also be introduced (vaccinated, recovered, tested).

The physical event will be complemented with the Formnext Digital Days two weeks later from 30 November – 1 December 2021. With the rapid growth of the AM community and demand for 3D-printed products in all areas of industry, it is vital to enable those still facing travel restrictions to participate in the exchange of ideas.

In 2021, Formnext is set to offer even more: On October 20-21, a digital pre-heat event will set the mood for the year's hot topics with some inspiring keynotes. For the first time, industry insiders will also have the chance to become part of the show and present their expertise and latest developments to the international AM community as speakers. A corresponding call – which includes other Formnext events, as well – has already begun.

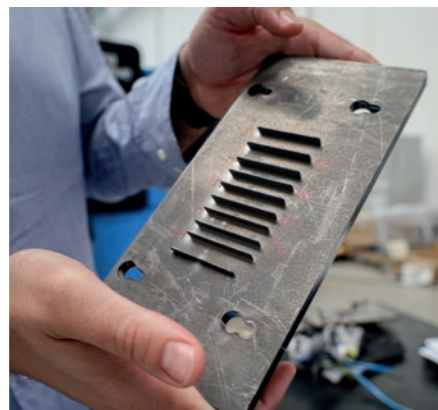
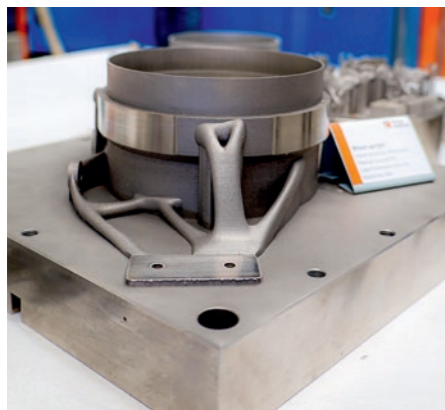
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# CHURNING OUT NEW DEVELOPMENTS WITH AN EAR TO THE MARKET

The industrial group Prima Industrie has launched the start-up Prima Additive, a dynamic manufacturer of metal AM systems

Top image:  
Prima Industrie's new headquarters in Collegno (Turin), Italy  
Bottom images:  
A 3D-printed component and test series



**O**n the facade at the entrance to the company's new headquarters in the north of Turin, orange rays point to the core of Prima Industrie. The publicly traded group, which has around 1,800 employees and annual sales of around €450 million, specializes in laser technology and has been building machines for sheet metal and metalworking on this basis for four decades. Given its technological background, it was really only a matter of time before Prima Industrie got into additive manufacturing, as well.

The group has already brought numerous series to market in additive metal manufacturing through its young Prima Additive division. Five of them are designed for selective laser melting (SLM), and four other machine types are based on direct energy deposition (DED). An impressive portfolio, considering that Prima Additive was only launched in 2018. Part of the reason why the division is capable of such rapid development has to do with how it can utilize the basic framework of Prima Industrie's welding and laser cutting systems (including machine structures and control systems) when designing its AM systems.

Text: Thomas Masuch

Photos: Thomas Masuch (4), Prima Industrie



Above left:  
Paolo Calefati, head of additive manufacturing and innovation at Prima Industrie  
Above right:  
The company's spacious showroom has various machines on display

## WORKING COMPETITIVELY

»Additive is competitive« – that's the slogan emblazoned across the backs of the employees in Prima Industrie's production facility. Paolo Calefati, head of additive manufacturing and innovation at the company, explains these T-shirts in more detail: »Our goal isn't necessarily to develop the most beautiful technology, but the one that allows our customers to work most competitively.« For Calefati, who has been with Prima Industrie for 12 years and played a key role in setting up its AM division, it's also important to work side-by-side with customers as a reliable and fair industrial partner that doesn't make unrealistic promises. »Unfortunately, the market is already quite full of people whose expectations have been shattered. We don't want to have any part in that,« Calefati affirms. To that end, Prima Additive also wants to leverage the experience and networks of its parent company. »We know exactly what's important in the automotive, tool-making, and aviation industries,« Calefati continues. »One of the keys for a machine supplier, for example, is a fair concept for service and after-sales.«

## APPLICATION-BASED DEVELOPMENT

This strategy seems to be resonating well with the market: Since unveiling its first product about two years ago, Prima Additive has sold about 50 AM systems – most of them powder-bed machines, according to Calefati. Its customers have mostly been research institutions, but have also included industrial companies. In the future, Calefati wants to grow further through internationalization because the »market in Italy is relatively small in this area.«

Despite these burgeoning sales, product development remains a priority at Prima Additive, which is advancing its related efforts based primarily on concrete applications. »We don't just develop based on interesting ideas; we listen carefully to the market,« Calefati explains.

One thing Prima Additive is doing in response to what it's hearing is strive for more automation. Surprisingly, however, the aim is not necessarily higher quantities or lower part costs. On the one hand, Calefati says, the machines from other areas of Prima Industrie are significantly more automated than its AM



systems, and Prima Additive simply has to catch up. The engineer also wants to make it easier for industrial companies to implement AM. »There are many companies that don't use AM at all, or only to a limited extent, because the equipment requires a high level of expertise and the right employees aren't always there,« he points out. In some cases, he adds, every employee has also developed his or her own production recipe, which makes it even more difficult to produce reliable, consistent results. »Automation can significantly reduce these problems because not as much expertise is needed to operate machines,« Calefati says. Companies thus become less dependent on operator know-how.

#### MORE AUTONOMY FOR AM

Meanwhile, Prima Industrie is planning to make its AM division even more autonomous.

Before the end of this year, the division is set to become the independent company Prima Additive S.p.a., with the Prima group as its main shareholder. In addition to designing and building AM machines, the new company intends to develop new technologies, especially in the AM sector. A corresponding cooperation has already been established with the Turin-based 3D New Technologies, which was founded in 2015 – by a certain Paolo Calefati and three other people. Besides acting as an incubator, Prima Industrie invested in the start-up to drive its further development. »With 3D New Technologies, we're developing new powder bed machines along with completely new technologies for additive manufacturing,« Calefati reveals.

At a newly built complex framed by nearby Alpine peaks that rise over 3,000 meters high to the north and west, the Prima group has

reserved a dedicated production hall for additive activities, underlining the importance it attaches to this area. Prima's additive offerings can also be found alongside numerous sheet metal working machines in its spacious showroom, which could comfortably house a medium-sized company.

#### FOCUSING ON NEW DEVELOPMENTS

The additive production hall also demonstrates how product development is as crucial for Prima as Calefati describes. In addition to machine assembly operations, two powder bed machines used for test series are located there. Hidden a little further back is the prototype of a new DED machine for which Prima has developed a new application head. »We want to present it as a world premiere at Formnext in November,« says a delighted Daniele Grosso, who handles Prima Additive's marketing efforts.



Paolo Calefati (left) and Daniele Grosso on the factory floor at Prima Industrie, where product development, assembly, and other activities take place

Photos: Thomas Masuch, Siemens

In an area of the hall that visitors normally aren't allowed to see, several technicians are working on another prototype that is still strictly under lock and key. The contraption's raw metal look and the open cables and connections reveal its early stage of development. Calefati, however, is already convinced

that this machine – which is likely to be unveiled next year, along with automation and a new type of powder bed technology – represents an impressive technological leap. »With it, we're going to eclipse the previous production speeds of conventional powder bed machines at a significantly lower cost of labor,« he claims.

**+ FURTHER INFORMATION:**  
 » [formnext.com/fonmag](https://formnext.com/fonmag)  
 » [primaadditive.com](https://primaadditive.com)

## NEWS

### JOINING ADDITIVE AND SUBTRACTIVE FORCES

A strategic partnership between Italian machining center manufacturer Belotti and CEAD, a Dutch manufacturer of large-format 3D printers, aims to combine additive and subtractive expertise to develop new machines. The collaboration is supported by Siemens, which will equip the new machines with its Sinumerik CNC automation system. By itself, large-scale additive manufacturing cannot deliver the finish and tolerances subtractive manufacturing offers. On the other hand, subtractive manufacturing is accompanied by a lot of waste. Combining these processes already gives the best of both worlds: making it possible to 3D print the near net shape of a part and afterwards milling it to the required tolerances with a CNC milling machine. With its new hybrid machine, CEAD and Belotti want to lower the overall business investment in new machinery, too.

»We will start our focus on the maritime and aerospace sector, producing molds, tooling, or even end parts, but this is only the beginning.

We see many applications to which this solution can make a sustainable and time-effective change,« explains Lucas Janssen, CEO at CEAD.



### MADE OF 70% RECYCLED MATERIAL

Alpaplasic, a company based in the northern Italian province of Varese, has begun selling a new type of sustainable filament spool designed for use in additive manufacturing. Along with a number of other Alpaplasic products, these spools (designation: RS 200 KDL PP5 gray PSV) have been certified with the Second Life Plastic seal, which guarantees that they are made of at least 70% recycled material. The company spent more

than a year working with its suppliers on a special »recipe« for recycled plastic. Alpaplasic says its new spools are compatible with any material that doesn't need to be dried when processed at high temperatures. The Second Life Plastic certificate was developed specifically for plastic products nearly two decades ago by the Italian institute IPPR. It explicitly indicates where the raw material used in such products was obtained. In the recycling pro-

cess, different types of plastic are collected from private households. They are then separated by special machines, washed, melted down, and extruded. The resulting granulate is sent to Alpaplasic, which uses injection molding machines to turn it into spools. Based on the highly positive feedback it has received about its recycled spools thus far, the company is expecting to sell tens of thousands of them every month.



# »THE PROSTHESES WALK AWAY, BUT THE INSTRUMENTS STAY«

When travelers from the US, Asia, and other parts of the world come to San Daniele del Friuli, they're usually in search of one thing: prosciutto crudo. That's what this small town in the far northeast of Italy is world-famous for because for centuries, its ham has been left to mature in dry Alpine winds and moist breezes from the Adriatic. Visitors to the nearby company LimaCorporate, on the other hand, are interested in something that has become a tradition much more recently. Additive manufacturing has been playing an increasingly important role in series production at this firm, which is one of the world's leading suppliers of prosthetic implants and associated instruments.

LimaCorporate's headquarters in San Daniele del Friuli, Italy



Text: Thomas Masuch

Photos: LimaCorporate, Thomas Masuch

## LimaCorporate S.p.A.

LimaCorporate is a global orthopedics company that specializes in digital innovation and tailored hardware. Its primary focus is on providing reconstructive and custom-made orthopedic solutions to surgeons. LimaCorporate's past is far more varied, however: Started as a family business in the aftermath of World War II, the company developed technologies across the aerospace, automotive, and (eventually) orthopedics sectors. Today, it operates directly in over 20 countries and offers products that range from large joint revision and primary implants to complete extremity solutions (including fixation).

When Michele Pressacco, vice president of research and development at LimaCorporate, looks out of an office window, he sees the peaks of the Carnic and Julian Alps to the north and west, which form Italy's border with Austria and Slovenia. In this picturesque and relatively secluded location, the medical technology company has written an impressive success story: In the past 20 years, it has grown from 70 employees to more than a thousand, and with 25 subsidiaries worldwide and annual sales of around €200 million, LimaCorporate is now a major global player.

Meanwhile, the company owes part of this success to additive manufacturing, which it has been using for more than 15 years. »Metal 3D printing was developed in the US, Germany, and Sweden, but Italy was one of the first countries where it was used industrially – in our case, since 2005,« explains Pressacco, who has been with LimaCorporate for almost 20 years.

## 3D-PRINTED OVER 100,000 TIMES

In San Daniele del Friuli, the powder bed process was initially used to create standard implants, and one of the world's most successful additively manufactured components was launched way back in 2007: an acetabular cup made of titanium alloy, which has now been 3D-printed more than 100,000 times. »The component has an outstanding clinical record and exhibits superior clinical performance compared to other conventional products on the market. Even after 13 years, we haven't had

to change it,« Pressacco happily reports. Due to the extensive regulations in the medical sector, a modified product would need to prove its ability to meet elaborate approval requirements all over again.

Created solely by means of 3D printing, the surface of the acetabular cup is very porous and thus promotes bone ingrowth. This finish, which the company has patented as Trabecular Titanium (TT), has been standard in LimaCorporate's AM manufacturing of implants for many years.

LimaCorporate also designs the special instruments that surgeons need to insert implants into the human body. This hospital equipment is very extensive: for a knee prosthesis, for example, over 300 instruments are supplied in six boxes. While they are mainly made of stainless steel, the segments that ultimately touch and move the artificial joints are fashioned out of titanium alloy, cobalt chrome alloy, ceramic, or UHMWPE (ultra-high-molecular-weight polyethylene).

These often very complex instruments require sophisticated designs, which is something that Pressacco and his team have to pay close attention to along with functionality. »The prostheses walk away, but the instruments stay with the surgeon,« he points out.

That's why design also plays an important role (along with quality and price) when it comes to buying implants and instruments on which surgeons have an important influence. »Since surgeons work with these instruments every day, they need to be both functional and

A wall full of patents reflects the company's strength in innovation







+ Riccardo Toninato (left) and Michele Pressacco in the AM area of LimaCorporate's product development division

Photos: Thomas Masuch

*Left image:*  
Michele Pressacco holds up a 3D-printed tibial plate that requires no cement  
*Right image:*  
Along with prosthetic implants, LimaCorporate produces sophisticated instruments that are needed for related operations – this guide for unicompartamental tibial resections, for example



elegant, as well as comfortable to hold,« explains Pressacco. In this area, he says, LimaCorporate can clearly distinguish itself from the competition. »Our customers keep saying that they see a special Italian design in our instruments.«

**CUSTOMIZED AM SOLUTIONS**

In the meantime, the company has significantly expanded its portfolio of 3D-printed products. In addition to standard implants, it manufactures individual designs that are mainly needed for patients with very serious bone damage (due to cancer, for instance) – often when other solutions are no longer sufficient.

Back in 2013, LimaCorporate consolidated this business unit under the ProMade brand. Hospitals now create scans for the specialists in San Daniele to turn into designs for implants in coordination with surgeons, and after several iterations, they arrive at a version that's ready for production. To make the design process even more efficient, LimaCorporate also acqui-

red TechMah Medical in 2018. The digital solutions of this US subsidiary largely automate the process of CT scan reconstruction by means of artificial intelligence.

**TAKING ADVANTAGE OF ROUGHER SURFACES**

LimaCorporate's designs for implants and associated instruments are created at its headquarters in San Daniele, where the company has built up an extensive product development department. At its core are several rooms that house an array of numerous AM systems, which the company proudly presents behind floor-to-ceiling glass panes. This is where metal prototypes and test series are created along with surgical templates, production equipment, and components made of plastic that are used in the laboratory or for patient-specific instrumentation. In the area of metal powder bed fusion, LimaCorporate also has some laser equipment, but mainly uses electron beam systems. »Electron beam manufacturing has worked very well for our needs. It's a bit faster, and even if it



results in rougher surfaces compared to other technologies, this can be an advantage for specific orthopedic applications,« explains additive manufacturing manager Riccardo Toninato.

LimaCorporate leverages this advantage at its production site in Sicily, which has about 15 Arcam machines that are currently 3D-printing 12 types of standard implants. Since starting its AM operations, the company has additively produced in excess of 200,000 standard implants. Its number of 3D-printed products is also expected to increase soon, as 10 implants and related instruments are currently undergoing product development in San Daniele. With this latest generation of 3D-printed implants, LimaCorporate aims to secure an important competitive advantage. »Here, we've optimized the topology of our designs for the first time, which further improves their performance in terms of force distribution from implant to bone, micromotion, and fatigue behavior,« Pressacco reports.

**MONTHS OF TESTING**

The decisive factor for implants is that they be reliable and provide extraordinary primary fixation thanks to the high level of friction affor-

ded by the porous structure of TT. Especially in the first weeks after surgery, the artificially created connection is critical, as Toninato explains: »After that, the bone is induced to grow into the prosthesis and connects to it organically very close to the trabecular bone by taking advantage of the morphological characteristics of the TT. Studies have shown a significant degree of new bone ingrowth after only 16 weeks, which allows for secondary fixation of the implant.«

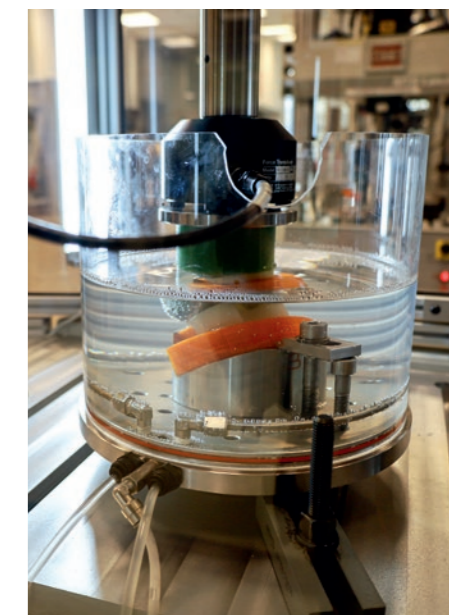
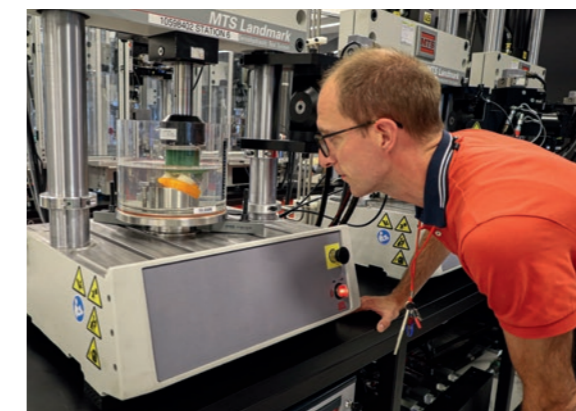
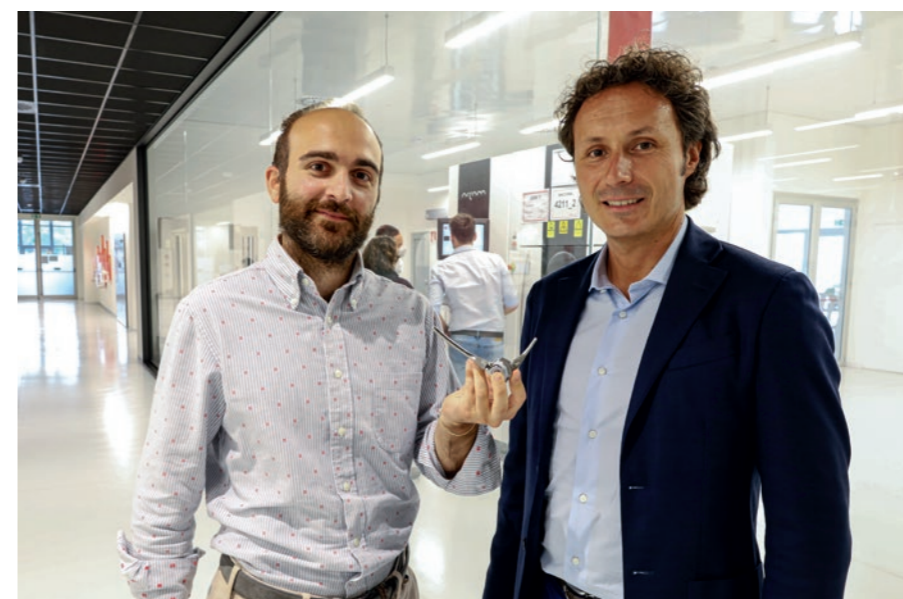
LimaCorporate assesses the stability and durability of implants in its laboratories, including in test series that can sometimes last several months. Implants rub together up to 10 million times and their material properties are examined at regular intervals for weight loss, as well as to verify if damage or cracks have occurred during the testing.

Such test series also help demonstrate the reliability of additively manufactured implants for shoulders, hips, and knees. »Despite all the scientific studies, many surgeons still believe it's better to use conventional knee implants and implement them with cement, for example,« Pressacco reveals. Yet LimaCorporate has »been able to prove many times that additive prostheses are more stable, last longer, and



Since bringing the design to market in 2007, the company has 3D-printed more than 100,000 acetabular cups with its proprietary Trabecular Titanium

Photos: LimaCorporate, Thomas Masuch (3)



Top-left image: Riccardo Toninato (left) and Michele Pressacco present a 3D-printed elbow implant  
At left and above: Laboratory manager Emanuele Butazzoni observes one of the many trials that test the stability and durability of LimaCorporate's implants

simply work better.« Pressacco and his sales team therefore do their best to convince skeptics of the benefits of AM at conventions and similar events. »What works best in winning surgeons over, however, is having them come to our company and see the entire process, including design, production, and quality control,« Pressacco says.

**FASTER PRODUCT DEVELOPMENT**

The fact that additive manufacturing has by no means overtaken traditional production in making implants is evident in the conventional production hall in San Daniele. Here, more than

40 milling machines and other metalworking equipment are lined up in a sophisticated and color-coded order. The production volumes are significantly higher than at LimaCorporate's 3D production site in Sicily.

That said, the conventional sector also benefits from metal 3D printing – in the development stage of some instruments, for example. Indeed, obtaining prototypes would otherwise take several months. »Additive manufacturing enables us to reduce that to a few weeks, especially in the early stage of development and for cadaver labs,« Riccardo Toninato explains. »Plus, improvements are easier to implement.«

**+ FURTHER INFORMATION:**

- » formnext.com/fonmag
- » limacorporate.com



# FROM AUTOMOTIVE TO AM DESIGN

ABACAD founder and CEO Daniele Borriero (left) and Adriano James Piras, head of business development and sales



When Jochen Loock, an automotive business development and AM technology consultant at Fraunhofer IAPT in Hamburg, was called to Turin by Stellantis to provide support for advanced innovation projects, he didn't expect to stay for several months and help usher in a new German-Italian cooperation.

Jochen Loock was working as Fraunhofer IAPT's lead advisor to the Stellantis Group (which includes Chrysler, Fiat, Jeep, Maserati, Opel, Peugeot, Citroen, and DS), which involved aiding the development of advanced bionic design and additive manufacturing technologies for low-volume series production. To enable the German engineer to work remotely for Stellantis, Abacad one of the group's long-term suppliers – offered him a place at its offices in the south of Turin, near Fiat's Mirafiori plant. Over coffee breaks, he kept talking

about the possibilities of additive manufacturing with Adriano James Piras, who is responsible for business development and sales at ABACAD. »We realized that we actually have very good synergies,« Loock now recalls. »At Fraunhofer IAPT, we have a lot of expertise in additive manufacturing, and Abacad has plenty of experience in product engineering, design, and construction, especially for the automotive sector.«

Its collaboration with Fraunhofer IAPT is a departure into a fairly new world for Abacad, as

well. Having been founded in 2000 by its managing director, Daniele Borriero, this engineering service provider's core business lies in the industry that shaped the economic fortunes of the city on the river Po for decades. »We're in Turin, so we build cars,« Piras puts it succinctly. He's been working for Abacad since 2019, but got into the automotive industry back in 2002.

To survive in the competitive automotive market, Abacad also relies on its many years of experience. While other organizations brag about their young workforce, Piras proudly

Text: Thomas Masuch

Photo: Thomas Masuch

presents his company's average age: 38. »Youth is no substitute for years of knowledge in a complex work environment like construction and design,« he declares. In addition to design experience, ABACAD has another advantage in the hourly rates that are paid to engineers and designers in Turin, which are lower than in Germany.

## INDUSTRIAL CHANGE

However, the days when the sheet metal presses in Mirafiori set the economic pace in Turin and the surrounding province of Piedmont are long gone. The Fiat plant has reduced its production by a factor of 10, and Lingotto (where the Fiat bosses Agnelli and Marchionne once had their offices) has now been transformed into a shopping center. Other car manufacturers have also scaled down their presences in Turin and its region.

Although the automotive industry is still Abacad's most important business area, the company has already responded to these changes and broadened its focus. In recent years, its 96 permanent employees and 30 freelancers have developed designs for yachts and excavators and implemented extensive development projects for the rail industry. Abacad has even designed the ergonomics of a submarine, and its customers now include Hitachi, Alstom, and Tech Mahindra Rail, to name just a few

## AN INITIAL PILOT PROJECT

Among its other forays into new industries, the company aims to tap into additional revenue opportunities by opening up a new area of business in CAD design for additive manufacturing technologies. Crucial to this is its collaboration with Fraunhofer IAPT, which represents a combination of additive knowledge and conventional engineering expertise. One of the main objectives here is to help companies identify components for additive manufacturing and save on production costs. »We're focusing primarily on companies with a large product catalog,« Piras explains. This is because they have to keep molds for spare parts on hand for years, which causes high costs.

A pilot project is currently underway with two companies that manufacture electronic components. If the quality and fire protection tests are passed and the results of a feasibility study indicate competitive production possibilities, an entire product catalog comprising more than a thousand parts will be analyzed for potential additive manufacturing.

## »NOT A TECHNICAL BOX«

To identify parts that could be produced using AM, Fraunhofer IAPT uses software from 3D Spark, a spin-off of two of its former employees. »At the same time, we're monitoring the design process at Abacad as the AM ›master-

mind, so to speak,« Loock explains. Meanwhile, five engineers at Abacad are specializing in additive manufacturing. »Our strength is in integrating the parts into existing components or an existing environment, which is a perfect fit,« Piras says. »After all, design and engineering isn't just about putting things in a technical box; more importantly, it's about finding solutions.« Jochen Loock is also convinced that human design work is not about to be replaced completely despite the numerous software solutions available. »For one thing, you can't automate creativity. And secondly, the design process is too complex to get reliably good results with artificial intelligence.«

## + FURTHER INFORMATION:

- » formnext.com/fonmag
- » abacad.it
- » iapt.fraunhofer.de

After all, design and engineering aren't just about putting things in a technicalbox; more importantly, it's about finding solutions.

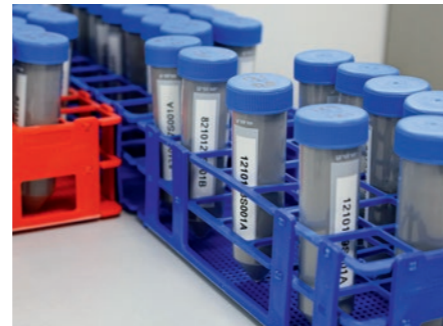


# HOT METAL AND ACCURATE ANALYSES

In the start-up Mimete, the industrial group Fomas has built up a highly qualified powder manufacturer within a short period of time

The neatly packed ingredients that will be used to prepare a metallic menu a little later are already lined up on the factory floor: small nickel ingots, a few bars of cobalt, and a few dozen kilograms of iron chips. Andrea Tarabiono, manufacturing manager at Mimete S.r.l., points up to a shiny metallic cylinder that's raised almost all the way up to the hall's ceiling by a huge steel frame. »There in the melting furnace, this is heated to between 1,600 and 1,800 degrees. The electrical induction currents enable the metals to mix very well,« he explains. A little lower down, the liquid melt mixes with argon and falls as a metallic mist. At the bottom, the alloyed droplets – which have since cooled to form fine powder grains – are collected, separated from the gas, and taken to the adjacent warehouse for further processing (e.g. sieving, quality control, and packaging).

The production of metal powder at Mimete in Biassono, Italy, is by no means limited to atomization in the VIGA (Vacuum Induction Gas Atomizer) machine that operates 12 meters above the ground. From the delivery of raw materials to packaging, samples are regularly brought in for examination in a laboratory located in a separate room of the production hall. »This is the only way we can ensure that the powder meets our strict quality specifications and can be used in customers' applications afterwards,« says Francesca Bonfanti, technical development manager at Mimete.



Text: Thomas Masuch

Photos: Thomas Masuch

## FROM HEAVY INDUSTRY TO AM POWDER

Mimete, a start-up founded four years ago that has been operating near the world-famous Formula 1 circuit in Monza since 2019, focuses on the production of metal powders for additive manufacturing. It was set up by the Fomas Group, which has been forging heavy-industry components from steel and other alloys for decades at its headquarters in Osnago barely 20 kilometers away. For Fomas and the 1,450 people it employs around the world, the fast-growing additive manufacturing of metal parts »appeared to be both a threat and an opportunity« according to Magda Perez Gila, the group's corporate communications manager.

Besides pouring significant resources into Mimete's modern powder atomization system in Biassono, Fomas has thus invested in an elaborate production process that includes the aforementioned laboratory, which is equipped

with the latest instruments. Mimete employs a young and high-powered team of 15 employees, some of whom previously worked at Fomas, and it also has some of its parent company's departments (such as marketing, accounting, and sales) at its disposal thanks to their close proximity.

At Mimete, the prevailing atmosphere is a mix of youthful team spirit and professional cooperation. Even though the company's team is still quite small, its processes are reminiscent of a well-established industrial group, and they consistently demonstrate the close relationship Mimete has with its parent company. Occupational safety, for example, is a top priority: As a visitor, you're only allowed into production areas wearing a helmet, a high-visibility vest, and safety shoes – and only after watching a detailed video on safety guidelines. In addition, access to the laboratory, the packaging depart- »



Opposite page:

The lab at Mimete plays a crucial role – in the center image, Francesca Bonfanti examines a sample

This page:

Operating at a height of 12 meters, the VIGA installation represents the core of powder production at Mimete



ment, or the VIGA machine is only permitted to those who also work there. »We also like to go out together in the evening,« explains Andrea Tarabiono, »but here in the production hall, we do our best to maintain the highest level of professionalism.«

**A CERTAIN LEVEL OF QUALITY TAKES A CERTAIN AMOUNT OF EFFORT**

Powder production in the VIGA, which generates up to 300 kilograms per batch and consumes up to 2,000 cubic meters of argon per hour, is by no means the end of the process. In containers filled with argon gas, the powder enters the post-processing department,

where it is sieved, then rotated in a container for homogenization purposes, and later packaged. »In the quality assurance system we've implemented, we take samples after each production step and analyze them,« says Andrea.

An important component of Mimete's complex production process is its laboratory, where powders are examined using XRF, ICP-OES, an automatic image analyzer, a Hall flowmeter, a laser diffraction analyzer, and various other techniques and devices. »Among other things, this allows us to identify the chemical elements in the samples, the granularity of the powder, and powder flowability, which is crucial for additive production,« says

Francesca Bonfanti. These extensive checks result in a workflow that takes 10 days to proceed from atomization to packaging.

In addition to their own samples, the lab staff examine the raw materials that are delivered. »We get them from certified partners, but also check them again ourselves to make sure no defects find their way in,« Francesca continues.

Mimete's high quality standards in production also require many other details, including the three hours it can take to fill the company's sieving machine with argon gas. »It's far more involved than simply opening a valve,« explains Andrea Tarabiono. The gas can also be heated



*Top image:*  
A large storage area for raw materials  
*Bottom image:*  
From atomization to eventual shipping, the powder is hermetically sealed off from the outside air



In addition to standard materials, the start-up has already achieved some initial success with the new alloys it's developing. »For a manufacturer of 3D-printed tool inserts, we adjusted some parameters of a certain alloy in order to enhance the durability of tools,« Francesca Bonfanti reports.

**PLANS FOR FURTHER DEVELOPMENT**

Mimete currently manufactures around eight tons of powder at its factory in Biassono every month, and it plans to significantly increase that amount in the future. At its production facility, neatly demarcated open spaces already indicate the further investments will soon follow. Andrea Tarabiono has a fairly precise plan in mind in this regard, and also sees the company as having reached another milestone in its development: »After two years, we have a very clear sense of the further equipment we need and the suppliers that will be a good fit for us.«

Over the summer, Mimete also made a somewhat smaller investment: A large olive tree was planted on the edge of the company premises that has since been enabling the company's production and lab employees to enjoy their lunch breaks in the shade. If Mimete continues to grow at the same pace, it won't be long before someone makes the connection between the tree and the subject of cloning!

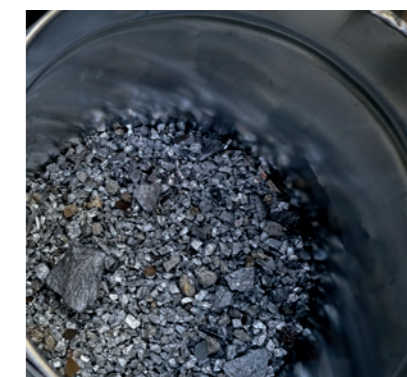
*Top image (from left):*  
Francesca Bonfanti, Andrea Tarabiono, Magda Perez Gila, and Giulia Conti  
*Middle image:*  
Mimete also tests the stability of components made from its powder  
*Bottom images:*  
The raw materials used for atomization include loose chips or rods of metal

to 500 degrees for atomization to further improve the quality of the powder. Even the quality of the bottles into which the powder is later filled and shipped has to meet special requirements: They're also filled with argon, after all, which forms a hermetic seal between the powder and the outside air from atomization to shipping.

**CREATIVE NAMING**

In going to all these lengths, Mimete wants to secure a place for itself as a supplier of high-quality powders among the numerous material providers in AM. The standard powders it offers are divided into the product groups Mars, Venus, and Neptune. The name of the company itself also stems from one of its founders' creative ideas: It references the Italian writer and chemist Primo Levi, who published a collection of short stories (Storie naturali) back in the 1960s that described a machine – the Mimete – that was capable of cloning any object or living being.

The young company's stable of customers already includes several OEMs (e.g. from the oil and gas and aerospace sectors), manufacturers of 3D printers, and research institutions. »We also produce for conventional material manufacturers that now want to sell their proven metals in powder form,« reports Giulia Conti, who works in sales support at Mimete. Many customers have been in the market for a long time and know exactly what they want in terms of element composition and flow rate, for example. »For them, we produce powder that meets their precise specifications – certified, of course,« Conti adds.



**+ FURTHER INFORMATION:**

- » formnext.com/fonmag
- » mimete.com



## TALKING ABOUT

# Heading South for a Change



Alessio Lorusso founded Roboze in 2013

Since its founding in 2013, Roboze has not only written one of the most impressive additive start-up stories in Italy and Europe at large. The company has also attracted attention due to its location: While virtually all the important companies in Italy's AM sector can be found in the economically important north of the country, Roboze's headquarters is in Bari, the capital of the southern region of Apulia. We talked to its 30-year-old founder and CEO, Alessio Lorusso, about the influence his home country has had on the development of his young company and the extent to which it is affecting Roboze's internationalization today.

Interview: Thomas Masuch

Photos: Roboze

*Alessio, the south of Italy was long considered economically underdeveloped and isolated. What is the region like today for a young high-tech company?*

**ALESSIO** A lot has changed already. Very important companies in the aerospace and automotive sectors have opened production facilities in the south. Still, there's a long way to go. What I can say is that now is the time for our region to become the place where high tech needs to start in Italy. Why? First of all, we have great universities – especially the Polytechnic University of Bari, which is one of the best in the country. These places produce some incredible talent. The fact remains, however, that there are only a few high-tech companies here in the south, which means these highly skilled people have to go to Milan or Turin, or to Germany or other countries, to find their dream jobs.

*Roboze seems to be an exception: You've not only retained talent from the region, but have even convinced professionals from northern Italy or abroad to move to Bari. What has motivated them, apart from the chance to work for an interesting company?*

**ALESSIO** One important factor is that the cost of living here is around half of what it is in Milan, Turin, Munich, or many other major cities in Europe. That means you can do more things with your free time and maintain a better balance between your work and private life. We have people from Germany and Spain, as well as a lot of engineers from Milan and Turin who have come to work with us in Bari.

*It sounds like your location has turned out to be a real advantage.*

**ALESSIO** Indeed, it is. At the end of the day, we can talk about technology, end-use parts, or whatever else you like, but behind these things, there are people. Our ability to retain talent and bring in expertise from the north is something I'm very proud of.

**Roboze**  
Roboze, a manufacturer of industrial 3D-printing technology for extreme end-use applications, was founded in Bari in 2013. It quickly developed an international customer base that includes large industrial groups such as General Electric, Airbus, and Bosch. The company now has more than 100 employees.



Roboze's headquarters in Bari, Italy

*When you got started eight years ago, the people who worked for Roboze were mostly from Bari, weren't they? How has this evolved over time?*

**ALESSIO** It was just me when I started, but yes – at the beginning, our employees came from Bari and other places in the Apulia region. It's much different now: Roboze has become a very attractive place to work for people from other places, as well. Our Italian headquarters in Bari hires people from all over Europe, which has made us an international company with an international atmosphere. It's wonderful.

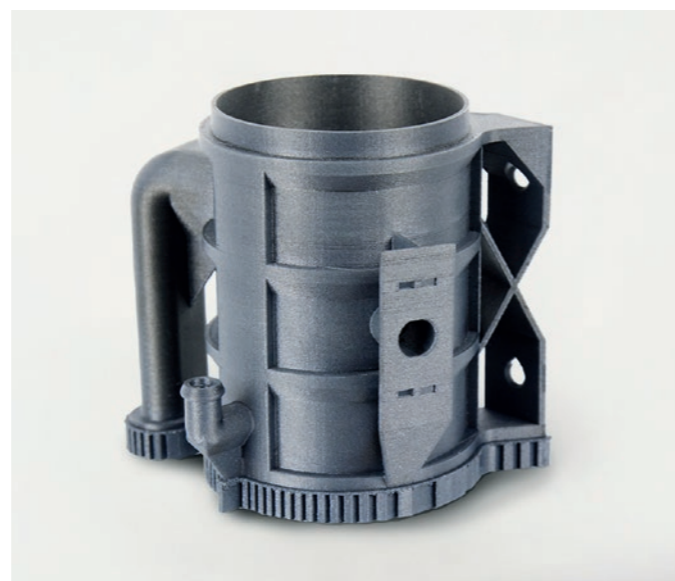
*And in the beginning, or in the first several years, where did your suppliers come from?*

**ALESSIO** 99% of our suppliers were around Bari, but over time, we expanded our base in this regard, as well. We now have a range of suppliers from the north of Italy, Germany, France, and other countries. At the same time, though, 80% of our product contains mainly Italian parts. It's very much made in Italy.

*You've described how your company has grown more and more international, having built up branches in the US and Germany. How important is it for you to maintain a regional Italian network of customers and suppliers?*

**ALESSIO** I think it's definitely important. Italy – and Bari in particular, since that's where our engineering headquarters is – has to remain the place where we create our technology. Of »





Roboze 3D-prints some of these components for the aerospace industry. The bottom two are made of Carbon PEEK, and the metal component above has been replaced by one made of Carbon PA

## We're changing the paradigm of manufacturing, and that's a long journey.



course, we're increasing our network and business opportunities in two other major countries where we've now doubled our presence. In the US, we've established all our operational areas, including marketing, customer support, engineering, and an application center. We'd also like to have everything in Germany sometime in the first half of next year, so we're going to hire 10 employees in Munich very soon. We already have nearly 15 people in the US, and we plan to add an additional 50 in the coming months.

*Has Roboze's success story inspired other local founders and given rise to something like a start-up scene in Bari?*

**ALESSIO** Something like that is in the process of being created right now. The Apulia region offers a lot of grants and benefits to start companies, especially in high tech. It has provided me with grants to fund my company and the technology behind it. The most important thing is that it's going to give founders courage, because that's really what it's all about.

*In your case, there was also the help of a large founding...*

**ALESSIO** Correct, but we didn't have any kind of financial support in the first several years. We used our own cash flow to arrive at that point, and then we raised money when the company was really ready to invest and hire new employees. That was back in 2018, when Intesa Sanpaolo – one of the major European banks – invested some special funds provided by the European Union for use in technology development. So, we had that first round of

investment – not with the European Union itself, but with a private venture capital firm that was managing funds from the EU.

*Looking back on the past years, can you name some major steps or milestones that really changed the development of your company?*

**ALESSIO** To be honest, on this kind of adventure, there are no major groundbreaking steps; it's a lot of very small ones. I think it's important to concentrate every day on those tiny incremental achievements. That's the key, because 3D printing is a long game. It's not cryptocurrency. It's not something that will appear and disappear within a couple of years. We're not only manufacturers; we're changing the paradigm of manufacturing, and that's a long journey.

*Still, do you have fond memories of any particular breakthrough that you've had?*

**ALESSIO** For us, the sales we made to GE back in 2016 were incredibly important. Why? Because we were among the first to introduce PEEK material in the 3D printing sector back in 2015. So, imagine the scene for a second: GE from New York purchases our machine from Bari, and we're probably 12 people at the time. We said to ourselves, »Guys, what's happening? Why has GE purchased one of our machines?« So I went to New York and installed the machine because I wanted to understand why GE had decided to do such a thing. I eventually realized it was because they had researched all the other printers and deter-

mined that ours was the most precise and the best for processing high-temperature polymers. That was when I understood that we'd found the right product for our market and were on the right track.

*Finally, let's talk about the future. What are your next steps?*

**ALESSIO** Conquering the world! That's the goal... No, I'm joking. Now that we've validated our technology with some major aerospace and automotive companies worldwide and industry leaders in Germany, the US, Italy, and other countries, we want to achieve dramatic growth. Companies in 24 countries are using our machines to produce real end-use parts. Roboze's goals are to scale up the adoption of our technology massively in the primary 3D printing market, hire an additional 80 employees in the next 12 months, and eventually expand to 250 employees in the next couple of years.

*Alessio, thanks for talking with us and giving us these insights.*

### + FURTHER INFORMATION:

- » [formnext.com/fonmag](http://formnext.com/fonmag)
- » [roboze.com](http://roboze.com)

# TRIBAL KNOWLEDGE MEETS STATE-OF-THE-ART PROCESSES



3D printed tibial plate

Between picturesque Lake Caldonazzo and mountain peaks over 2,000 meters high in the northern Italian province of Trento, the industrial company Lincotek has built up an AM production facility for metal over the past 15 years that is certainly one of the world's pioneers. »We are indeed a hidden champion,« explains CEO Winfried Schaller without exaggeration, referring not to the location in the side valley near the city of Trento, but to the fact that his company often still hovers under the radar outside the medical technology, gas turbine and aviation sectors.

As early as 2006, company founder Nelso Antolotti decided to use this additive manufacturing technology, which was hardly widespread at the time, for the production of medical products. His business, which had specialized in coating parts for the medical technology, gas turbine and aerospace industries since the 1970s (see info box), 3D printed its first products a year later. At the time, the company was one of the world's first users of this innovative technology in industrial manufacturing in the metal sector.

Based on more than 15 years of experience in additive manufacturing, the AM division at Lincotek has now grown to more than 25 machines at locations in Italy, Switzerland and the USA. Since 2007, the company has additive manufactured more than half a million parts, and the current production rate is around 100,000 parts annually (110,000 in 2020). In northern Italian Trento province, the company operates its largest AM production facility: at three sites, 19 systems with more than 30 employees are used exclusively to manufacture

#### Lincotek Group S.p.A.

In 1973, Nelso Antolotti founded the Flametal company in Parma and evolved it as a specialist in coating, focusing on medical technology, gas turbines, aviation. Today a total of 16 facilities are in the group, part of which built up as greenfield locations and others from acquisitions allowing the group to grow to over 1,100 employees. In 2020, as part of a rebranding, all previous subsidiaries were merged into the newly created Lincotek. The group is divided into the Surface Solution, Medical, Equipment and Additive divisions. Founder and President Nelso Antolotti is still actively involved in the company as well as his daughter Linda, Group Vice President.

Photos: Lincotek (2), Thomas Masuch

Text: Thomas Masuch

medical products (orthopaedic implants and instruments). In addition, the site in Memphis, USA primarily serves the US medical market. The center in Spreitenbach, Switzerland meanwhile focuses on industrial applications, primarily components for the industrial gas turbine (IGT) and aerospace industry.

»With our machinery and additive knowledge, we are one of the world's leading AM service providers for serial production,« says Winfried Schaller, CEO of Lincotek Group. The German native, who has lived in Italy for the past 20 years, is very passionate on the future of additive and sees his company in an excellent position, stating: »Additive Manufacturing is a disruptive technology and we have years of experience of meeting quality and reliability standards required in serial production. Not only that, but we can also integrate subsequent supply chain steps such as heat treatment, coating, machining etc..«

#### GROWTH AND INVESTMENT

Over the past five years, the Group has invested heavily in new AM equipment. Outgrowing the first site with seven metal 3D printers, a second area was opened in Trento and a third was recently added to be ready to sustain future business expansion. To raise the capital for additional growth and M&A activities in additive manufacturing and other areas of the business, the Antolotti family this year opened its capital for a minority shareholder, called The Equity Club. This is an Italian investment initiative, supported by over 90 entrepreneurial families, which invests long-term in healthy companies to further strengthen their growth. »Through the engagement of The Equity Club, we are able to make important investments. At the same time, Lincotek remains majority family-owned and is able to stick to its core values and long-term business orientation,« Schaller explains.

#### STATE-OF-THE-ART AM PROCESS

The second site in Trento - opened five years ago - is the company's Additive Innovation center, focused exclusively on medical additive manufacturing. In the state-of-the-art, climate-controlled production hall, where not a speck of dust sticks to the antistatic floor, 12 metal printers (ten EOS M270 metal printers and one each from Concept Laser and Renishaw) line up, monitored in real-time mode by a control desk at the entrance. »And the impressive thing is, they're all running and producing parts 24/7,« says Emmanuele Magalini, Manager of the Additive Engineering Department. In addition, the site has a vacuum furnace, a quality assurance department, a laboratory where powders and material samples are tested, and a workshop where parts are removed from the build plate and finishing work is done at a milling center. However, AM components are generally sent for finishing »

We manage to find creative solutions at a high level – this is not about cutting corners or simplifying things, but about finding solutions where others do not see them.



Left image: Winfried Schaller, CEO of Lincotek  
Right image: A 3D-printed joint socket





»Producing 24/7«: AM operations at the Additive Innovation Center in Pergine, Italy

service to another Lincotek location in Bologna, a fully dedicated CNC machining center.

In addition, Lincotek employs a team of 10 engineers with skills that range from the design of orthopedic products and the development and validation of new processes to the design transfer of the OEM's concept. We also support customers in creating patient-specific prostheses on the basis of CT images and in close consultation with surgeons. As well as the perfect fit in the bone bed, this sometimes also involves weight reduction, which can be particularly important for larger implants (e.g. in tumor patients). Here, Lincotek's additive services can look very different depending on the customer: »For some, we take care of everything from device conception and manufacturing through to finishing and packaging. For other customers, we take care of 3D printing only, or sometimes just post-processing,« reports Schaller, who sees this flexibility as one of Lincotek's major strengths.

**GROWTH AND OBSTACLES**

The modern AM site in Trento is designed to leave room for further growth. For example, in addition to metal printers on site, there is still space for five to ten more machines. »This will certainly be filled in the next two years, so

we have already started planning for another AM production site,« explains Gennaro D'Andrea, head of Lincotek Medical business, who is looking at a global platform for additive manufacturing. In the medical technology sector especially, D'Andrea still sees enormous growth potential. »Here we have only scratched the surface. This sector is just in the process of gradually 3D printing more and more, having traditionally manufactured components previously.«

Looking at the transition of complex parts from traditional manufacturing technologies to AM, in the eyes of Schaller the pace of additive development is still too slow. »Additive manufacturing is actually a disruptive industry. But you have to ask yourself why it's not progressing much faster, especially in the series production of metal parts,« Schaller explains. He sees blockages that are still slowing down additive metal manufacturing on its way forward: »We often have to deal with a large number of decision-makers with potentially very different interests. That doesn't make it easy to implement new, innovative solutions.« On the other hand, customers often lack confidence in additive manufacturing - something Schaller understands in some cases. »Switching from conventional manufacturing to AM is a huge

Photos: Lincotek

step for customers. Not only do they need to be able to rely on getting good parts, but they also need to know that their service partner will still be on the market in five years.«

**ITALIAN ENGINEERING SPIRIT EMBEDDED IN THE DNA**

As an established industrial company, Lincotek wants to create or increase precisely this confidence within additive manufacturing. For further growth, Winfried Schaller wants to

focus primarily on complex parts made of metal, »whereby we are taking a strongly application-driven approach.« In addition to the high efficiency of its own production, Schaller also sees Lincotek's strength in what the company calls its »tribal knowledge« or »savoire faire«. Schaller describes it as something continued by people, the perfect union of skills and expertise handed down within the company year after year, and the deep scientific and technological knowledge built up through years of research

and development. »You can't copy that. An example? Our AM team has developed its own special process for heat treatment.«

In addition, Schaller says the company benefits greatly from the special Italian engineering spirit that founder Antolotti has implanted in the company like a DNA and continues to cultivate: »We manage to find creative solutions at a high level – this is not about cutting corners or simplifying things, but about finding solutions where others do not see them.«



Top image: Employees monitor the 3D printers at the Additive Innovation Center in real time from this impressive command center  
Bottom image: The vacuum oven Lincotek uses for heat treatment is also located nearby



**+ FURTHER INFORMATION:**

- » formnext.com/fonmag
- » lincotek.com

## »OUTSIDE THE BOX«



# High level of intensity and perfectionism

When I decided quite a few years back to visit Pozzuoli – a small southern Italian city where the emperors of Rome once spent their summer vacations – I strapped on a backpack and boarded a train in nearby Naples. It started out in the right direction, but ended up making a wide arc around my destination on the northwest edge of the Gulf of Naples. I eventually hopped off the train at a station in the middle of nowhere and resigned myself to covering the last few kilometers on foot. As I was trudging down the road, a beat-up Fiat Panda pulled up alongside me and rattled to a stop. The man behind the wheel was Pino, a fisherman who had seen his share of summers. Featuring shorts, well-worn flip-flops, and a shirt full of holes, his overall appearance wasn't much more impressive than that of his vehicle. After we got to talking about Italy, its history, and the country's southern regions, Pino asked me if I knew where I'd be spending the night what I denied.

We stopped at a bar for an espresso and then drove along the coast to Cape Miseno, a picturesque rock formation that's just a stone's throw from the islands of Procida and Ischia. There, Pino stopped at one of the nicest hotels in the entire region and parked his Fiat right out front, where it definitely stood out among the other guests' luxury sedans and their dark tinted windows. »You can stay here tonight,« he said. For a moment, I was rather worried about my vacation budget, which was meant to last me another week. »It's all right; I know the owner,« Pino added, as if he had read my mind. He left me to get settled in but returned the same evening for dinner – pasta and finest seafood, which we enjoyed at a restaurant called Giardino degli Aranci (the Orange Grove). When I checked out two days later, the bill really was about what I would have paid for a B&B.

The thing I've always found fascinating about Italy is this unique combination of openness, hospitality, improvisation, and indulgence – not

to mention the understanding that things aren't always as they seem. I've never been to another country where I've encountered the same intense lust for life coupled with the pursuit of perfection, be it in the arts, the local cuisine, or the simple enjoyment of the finer things in life. I've often wondered how people manage that intensity on a regular basis: Do they have to rein it in in their daily lives, or does it just burst forth on another level? The well-known Italian rapper Fabri Fibra may have the answer. In one of his most famous songs, he describes Italy as a land of irreconcilable differences. It's a place that somehow represents la bella vita, grand theaters and galas, high fashion, fancy cars, gun-toting mobsters, and homemade pasta all at once. For Fabri Fibra, it's il paese delle mezze verità – the nation of half-truths.

That same level of intensity and perfectionism is something I've seen in many Italian companies, as well, which often combine a pioneering spirit in the realm of business with considerable expertise in design and engineering. At the same time, though, I've had a number of conversations with people from such organizations who have told me about the country's frustratingly opaque bureaucracy. It's no wonder that entrepreneurs tend to describe good tax advisors as »magicians«.


Despite their considerable abilities and keen sense of innovation, however, some Italian AM firms remain significantly underrepresented in the media. While start-ups with millions in backing (particularly from the United States) are constantly making the rounds in specialist publications and other channels before having sold a single machine, their counterparts in Italy – several of them pioneers in AM production – are still only familiar to those in the know.

Perhaps this edition of our magazine will help change things a bit in that regard. Italy has also been chosen as the partner country for Formnext 2021, which is sure to give the country's AM industry a further boost in the eyes of the rest of the world. Plus, the event may have a few unexpected encounters in store for those who attend!

Text: Thomas Masuch

Illustration: feedbackmedia.de, iStock / Vectorcreator, coolgraphic, kukurikov

## END OF ISSUE – CONTENT CONTINUES



### AM Field Guide

The AM Field Guide is a hands-on introduction and provides an initial, structured overview of the complex, multilayered world of additive manufacturing processes.

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