Fraunhofer
IAPT

Fraunhofer Research Institution
for Additive Manufacturing
Technologies IAPT

Annual report 2021/22

Industrializing AM 4U

www.iapt.fraunhofer.de

»For industry to respect planetary boundaries, it needs to be sustainable. It needs to develop circular processes that re-use, re-purpose and recycle natural resources, reduce waste and environmental impact. Sustainability means reducing energy consumption and greenhouse emissions, (…) Technologies like AI and additive manufacturing can play a large role here, by optimising resource-efficiency and minimising waste.[1]«

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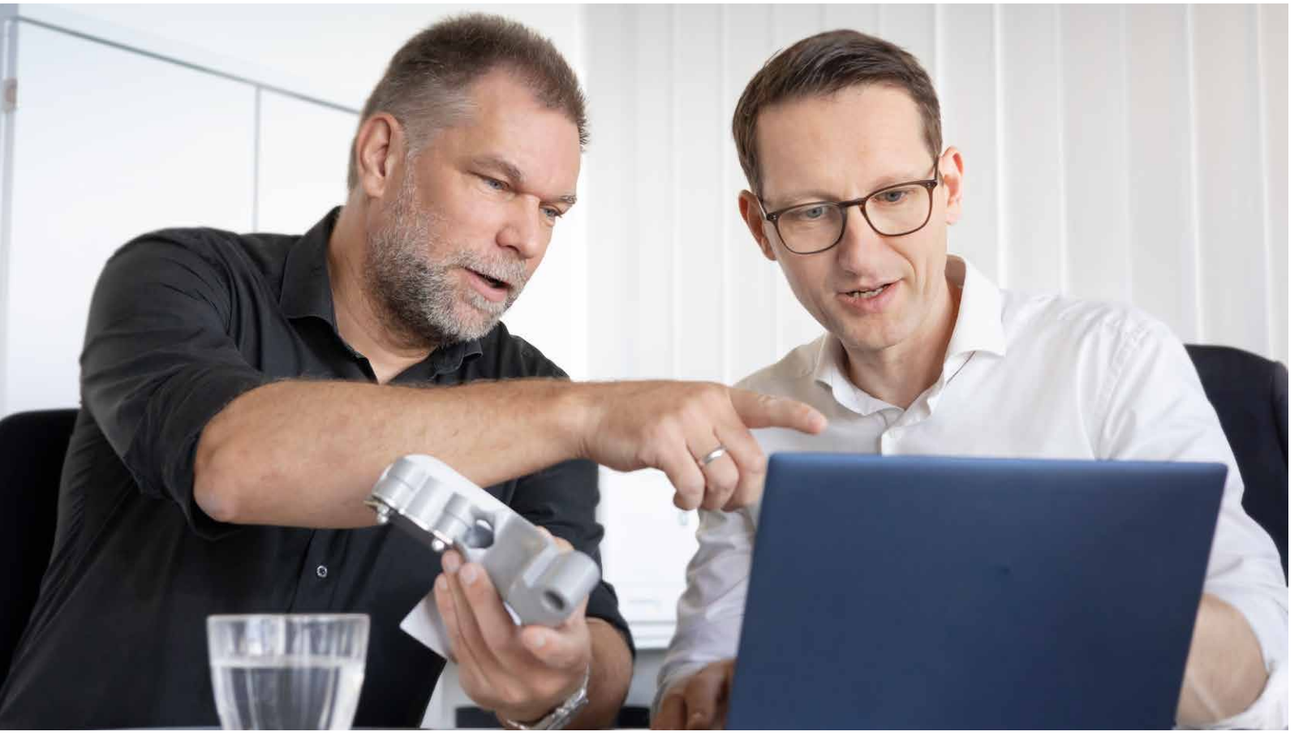
Interview with the institute leadership

The idea behind the European Union's Industry 5.0 concept is to broaden the Industry 4.0 approach by using research and innovation for the transformation to a sustainable, people-oriented and resilient European industry.

In this interview, Ingomar Kelbassa, head of the Fraunhofer Research Institution for Additive Manufacturing Technologies (IAPT) and the Institute for Industrialization of Smart Materials (ISM) at TUHH, and Frank Beckmann, deputy institute head and Virtualization department head at Fraunhofer IAPT, explain what Fraunhofer IAPT stands for and what contribution it makes to sustainability and productivity as well as to resilience and prosperity for our society.



Institute leadership at Fraunhofer IAPT:
Prof. Ingomar Kelbassa (on the left) and Frank Beckmann (on the right)

Since April 2022, Prof. Dr. Ingomar Kelbassa has headed the Fraunhofer IAPT. What has changed since then?

Frank Beckmann: Ingo has established a culture of participation. Department heads, group heads and future field heads have been given considerable flexibility in helping to shape the institute and lead their field to success. That means both freedom and responsibility.

Prof. Ingomar Kelbassa: It is all about flat hierarchies and an openness to discussion. I want to encourage everyone to become involved not only in defining the topics for this institution, but also in human interaction. Call it New Work or Empowerment – it has helped us to maintain and even expand selectively our expertise and know-how, both qualitatively and quantitatively, despite staff turnover and a shortage of skilled workers. At the moment, we still lack growth, but we have been able to consolidate our position and, in particular, increase our industrial relevance.

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As a team, we want to shape the future together.«

What can clients expect from Fraunhofer IAPT today?

Frank Beckmann: The institute has become more strictly focused on the industrialization of AM manufacturing routes for societally relevant end user fields. We succeeded in realizing significantly larger industrial projects. Today, our focus is less on the quantity of projects and more on the quality and size of individual industrial projects. In this context, we also meet our external partners and clients on an equal footing.

Prof. Ingomar Kelbassa: Regardless of whether it is a public client, such as the Federal Ministry of Education and Research, the Federal Ministry for Economic Affairs and Climate Action or, in the university environment, the German Research Foundation, a student or – as in the original sense of the Fraunhofer-Gesellschaft – a client from industry: We take all challenges seriously and offer industrial solutions. As a team, we want to shape the future together.

It is crucial not only to retain the utilization in the field of 3D printing and AM manufacturing routes in Germany, but to explicitly increase our competitive position. The added value of AM in the industrial environment needs to be generated, created and exported worldwide in Germany.

How does Fraunhofer IAPT support the added industrial value of 3D printing?

Prof. Ingomar Kelbassa: AM is a digital production technology. You can take CAD data, slice it into different layers, translate it through the post processor and send it to the plant. Then, you create the product by pushing a button. If AM allows every end user and also every consumer to become a manufacturer themselves – in other words, to become a so-called prosumer: To whom do you still sell your know-how and expertise? This is effectively a conversion of a traditional, product-driven sales approach to a purely digital business model.

Frank Beckmann: If we take this even further, each CAD file can be printed an unlimited number of times. Therefore, you actually want to sell the right to print this data only once. For this purpose, for instance, we develop digital solutions – security solutions based on blockchain and so on.

Not only do we provide our clients from the industry with technological know-how, but also with business insights and ideas: How can you produce a component in the fastest and most cost-effective way? To whom do you sell it then and how?

Prof. Ingomar Kelbassa: Thanks to our holistic view of industrial value chains, we are one step ahead of companies such as KPMG, PricewaterhouseCoopers or McKinsey. Our understanding of technology and business enables us to anticipate the questions of the future and deliver tomorrow's answers already today.

Where do you see the social relevance of the research at Fraunhofer IAPT?

Frank Beckmann: In our current four future fields: This is where we address topics such as security and defense and thus, for instance, the changed security situation since February 2022. The life science future field addresses demographic change as a major societal challenge. And in addition to the energy future field, we are also involved with mobility. This is something we can do particularly well in Hamburg – on land, on water, in the air.

Prof. Ingomar Kelbassa

We must not relinquish market leadership to China or the USA.«

Frank Beckmann

Not only do we provide our clients from the industry with technological know-how, but also with business insights and ideas.«

Prof. Ingomar Kelbassa: Located in the Hamburg metropolitan region, we are in a unique location worldwide: We have the overseas port here. We have the Deutsche Bahn here. We have automotive manufacturing here. With Airbus and Lufthansa Technik, we have aerospace companies and even aeronautics companies. This is complemented by cooperations with non-university research institutions such as Leibniz or Helmholtz and DESY. Next come university partners, starting with the TU Hamburg and the Helmut Schmidt University of the Federal Armed Forces to the HAW and the University of Hamburg. We have everything here to create a beacon of industrialization of AM manufacturing routes. In my opinion, there is no other site in the world that can offer this!

Is AM a key technology, then?

Prof. Ingomar Kelbassa: To me personally, AM is not yet a key technology, but is well on its way to becoming one. The problem is that Germany and Europe do not yet see AM as a key technology of the future. China and the USA have already realized this and are closely on our heels here. We at Fraunhofer IAPT call for expanding recycling opportunities in Europe and especially in Germany with German and European partners, and for not relinquishing market leadership to China or the USA.

As a high-wage country, we can only maintain our market leadership in manufacturing and production if we are simply faster than everyone else with our innovations. We must not allow ourselves, as a national economy, to be faced again with a situation in which groundbreaking technologies are invented in Germany but not innovated and commercialized in Germany: There must be no more Transrapid 2.0, no more Photovoltaics 2.0, no more OLED 2.0. It is our modest contribution to enable our industry to profitably bring AM into value creation through production. This is our mission.

And what about sustainability?

Frank Beckmann: We also have major initiatives underway. We are looking at how to make the AM production route more sustainable. What are the leverages? Where are the main CO_2 emission sources or the points where we are not yet optimally on track? We measure this in order to optimize the process chain in the second step.

The other and greater leverage can be found in the products: They save immense resources over their life cycle. For instance, a lightweight component in the aviation industry saves an enormous amount of kerosene and thus has an even greater leverage than the process chain. There are various examples for this.

Ingo, for instance, looks back on an extensive history in the field of gas turbines. Here we are currently burning natural gas, in particular ergo methane, in other words CH_4. Such turbines would no longer be feasible with conventional casting production routes.

Prof. Ingomar Kelbassa: When it comes to the hydrogen economy and the (re)electrification of hydrogen, it is important to be able to flexibly (co)combust hydrogen H_2 or ammonia NH_3. Hydrogen burns at temperatures about 200 Kelvin higher than natural gas. A modern gas turbine simply cannot withstand this in terms of thermomechanics. Which means engineers have to redesign or reconstruct the entire hot gas path – from the combustion chamber to the first two high-pressure turbine stages – and then represent these new components in terms of manufacturing technology: This can no longer be done without AM.

What is the next big step on the road to industrial use of AM?

Frank Beckmann: In any case, we need to move away from stand-alone technology, where a plant somewhere singularly produces prototypes or individual parts, and towards full integration into factory structures. Furthermore, Additive Manufacturing is still in part a fairly manual and less automated manufacturing route. Our plans for the new building include fully automated, end-to-end process chains for plastics and metal – both physically and in the digital process chain.

Prof. Ingomar Kelbassa: The trend is clearly toward virtualization. You could otherwise only optimize individual process steps autonomously and not the complete AM production route, that is, end-to-end. The second major trend is definitely automation. And the third trend has to be resilience: Meaning that we not only look at the horizontal process chain from design to the finished end product, but also at the CO_2 footprint of the product life cycle. And that we resiliently grow the supply chain with tier one and tier two, independent of third countries. We must be able to carry out everything ourselves on site – from raw material production to the finished end product, including MRO (editor's note: Maintenance Repair Overall) of the component and all the way to recycling.

Is this a vision of the future or are there already projects at Fraunhofer IAPT?

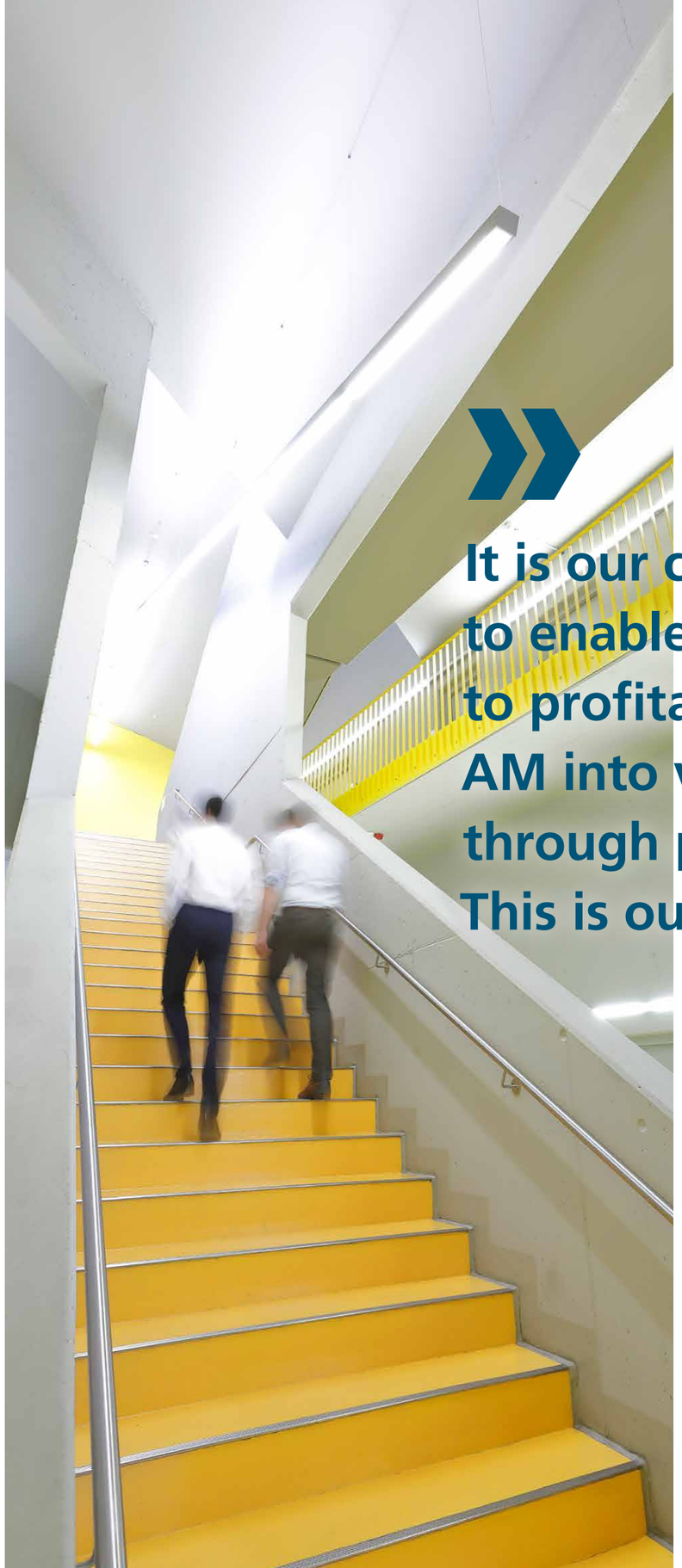
Prof. Ingomar Kelbassa: As part of our IAMHH® initiative, two of three pilot projects are dedicated to building a resilient AM infrastructure on site. First, a Germany-wide end-to-end representation – meaning from the design to the finished end product including life cycle. In the second project, we even map the complete life cycle locally on the Hamburg city area. We intend to demonstrate the whole thing for two materials, Germany-wide for metal, locally in Hamburg for plastic.

I believe that once this success story has been written, it motivates us to move in the direction of decentralized, automated production. Needless to say, the motivation is significantly higher if you can show at the same time: You need significantly less raw material to create this product with the production of components using an AM production route. And you need significantly less energy. Ultimately, in a benchmark comparison with any type of conventional production, the AM production route is potentially even the most sustainable solution in terms of its CO_2 footprint, and the most cost-effective as well.

When productivity has been demonstrated, every manufacturing company in the world will at least look at AM, use AM as a complement to conventional manufacturing or even switch to AM altogether. That is where we are heading: Towards »green manufacturing« with AM.

Ingo and Frank, thank you very much for the interview!

Interview with the institute leadership

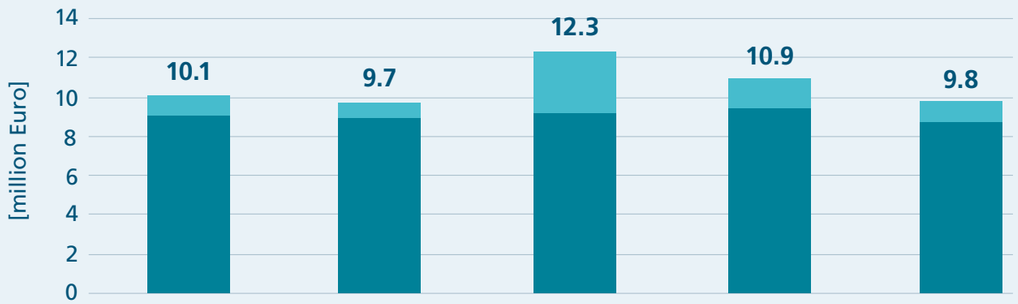


»It is our contribution to enable our industry to profitably bring AM into value creation through production. This is our mission.«

The institute in figures

The institute in figures

Overall budget



19,2 %
Business income

External revenue

1.7 Economic income

1.7 Contribution from Hamburg

3.4 German federal government

0.3 EU

0.8 Miscellaneous

As of December 31, 2022

Institutional funding

1.9 Basic funding

0.3 Internal Fraunhofer programs

Expenses

5.9 Staff

2.7 Material

1.1 Investments

Employees

55 engineers and scientists

8 technical employees

16 internal services

39 students

Fraunhofer IAPT industrializes Additive Manufacturing and designs production environments for value creation with resilience and sustainability.

What drives us? Innovations with social relevance.«

In 2022, Earth Overshoot Day fell on July 28. According to the German Federal Environment Agency, Germany had already used up its allotted supply of natural resources on May 4.[2] However, even if our demand for resources exceeds planetary limits, there is no going back to a preindustrial age. We are facing a challenge on many levels – in global competition as well as between generations. In this context, we refer to the European Union's concept of »Industry 5.0.«

We are industrializing Additive Manufacturing for a more sustainable production and a resilient European economy that benefits our society.

Four exemplary projects at Fraunhofer IAPT illustrate how this works.

Stable Additive Manufacturing processes

AQM
Additive Quality Manager

Continuous data acquisition

The Additive Quality Manager® (AQM) enables the continuous recording of process data and quality-relevant meta information (e.g., process parameters, powder changes).

All relevant quality data is recorded, digitized and aggregated. To minimize the effort required for data maintenance, the AQM has interfaces to production systems, data preparation software and measurement technology. The time-consuming filing of Excel tables and PDF documents is now a thing of the past.

The requirements for documentation in the regulated market are increasing

With the AQM, all relevant information about a produced component can be bundled and called up. The main advantages are time savings when searching for data and ensuring traceability.

Recording which correlations exist and reducing the effort for error analyses

Process data analysis helps to quickly identify process deviations and to recognize the causes. The AQM is an efficient tool for continuous process improvement. It also provides reliable information on the relationship between influencing variables and target values.

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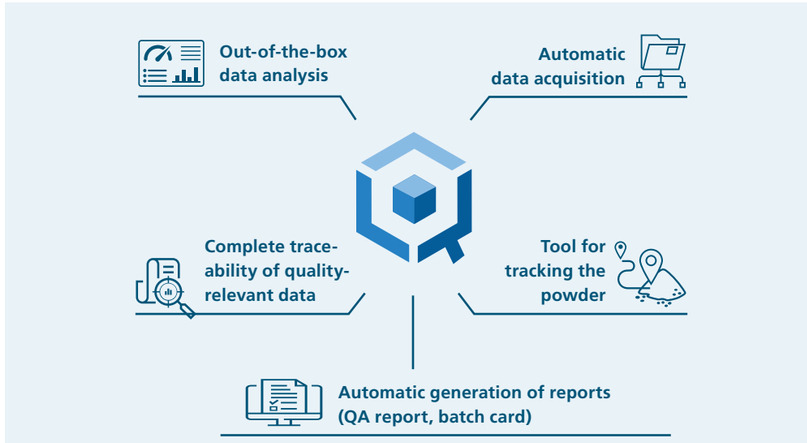
The digital analysis of process data enables continuous improvements in quality and stability.«

Statistical analysis of the process data



Five core features of the Additive Quality Manager®

Additive Mobile Factory®

Supply chains for goods and services have become increasingly complex due to global networking. Individual failures within a supply chain can disrupt the entire chain, as the SARS CoV-2 pandemic has clearly shown. Even without a pandemic, bottlenecks can occur far from stable supply routes. This particularly affects sectors in which downtimes cause high follow-up costs, such as the power generation industry.

To enable quick reactions in the event of a failure and to minimize downtimes, large stocks of spare parts are kept on hand. The stored components serve to put machines and systems back into operation as quickly as possible. However, maintaining such stocks is cost-intensive and inflexible. It is not uncommon for spare parts worth millions of euros to be kept in stock, solely as a fail-safe measure. Most of them are never called up.

When it comes to reliable and fast spare parts supply, Additive Manufacturing already plays a decisive role today. Spare parts can be produced without separate tooling or warehousing costs directly and as required. Additive Manufacturing contributes significantly to the flexible and short-term supply of spare parts.

A further idea and lighthouse project at the Fraunhofer IAPT is for companies to print components not only on request but also directly at the place of use. The elimination of transportation routes can significantly reduce the delivery time of spare parts. Broken-down machines get back into use more quickly. However, not all potential locations where spare parts are needed have the necessary infrastructure to print them.

As a solution, the Fraunhofer IAPT offers modular mobile container production units that can be used as independent production cells at different locations, plug & play, as required.

With an infrastructure adapted to the application in one or two container units, the Additive Mobile Factory can be used mobily and flexibly on site as a repair solution and spare parts production of metallic components. The development of the solution places a particular focus on the simple operation of this mini factory. Even inexperienced users must be able to 3D print components without having received extensive training in advance.
A consistently digitized and networked process chain within the container solves the challenge. If necessary, augmented reality (AR) glasses provide users with additional support for operation.

The first physically constructed container, the Additive Mobile Factory®, is equipped with the wire arc additive manufacturing process, a process sensor system developed at the Fraunhofer IAPT, and a high-speed cutting milling spindle for finishing components.

The container has already been used several times in remote applications and stands out in particular due to its fast setup and robust system technology.

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Additve Mobile Factory®

In the Additive Mobile Factory®, an industrial robot autonomously carries out the manufacturing process from printing to milling, enabling the fast, local production of spare parts.

Its quick setup and robust system technology distinguish the Additive Mobile Factory® in remote use.«

Adaptable and load-optimized connection nodes expand the applications of bamboo tubes for sustainable construction methods.

DED node structures for building with bamboo

Bamboo is one of the fastest-growing plants in the world and can be used in construction after 3 to 5 years. It binds an above-average amount of CO_2, and due to its naturally high-strength properties, bamboo is particularly suitable as a construction material. However, no bamboo tube is the same, making the development of reliable connections challenging.

Additive Manufacturing offers the possibility of creating adaptable and load-optimized connection nodes, expanding the applications for sustainable construction methods.

DED node structures for building with bamboo

Fraunhofer IAPT has taken on the challenge of specifically optimizing the wire and arc additive manufacturing (WAAM) process for use in construction. The focus is on producing thin-walled structures made of stainless steel with a high surface quality. Additionally, construction and process strategies are being developed for the specific realization of node structures.

The number of bamboo tubes to be connected, their respective diameters, and the angles between them can be flexibly adjusted in the design. This allows for an ideal interface between bamboo and node, and the good surface quality means that further machining is hardly necessary.

Manufacturing directly at the construction site with the Additive Mobile Factory®

By deliberately expanding the process window of WAAM to thin structures (<2 mm) and smooth surfaces, costs can be saved in comparison to other additive processes.

The streamlined process chain with WAAM and post-processing is accommodated directly in the Additive Mobile Factory® in the specific application. This allows the node structures to be flexibly manufactured on site without depending on supply chains. This approach offers promising possibilities for redesigning construction and represents another exciting application of the Additive Mobile Factory® alongside decentralized spare parts manufacturing.

»We have specifically optimized the wire and arc additive manufacturing process for use in construction.«

Additive Mobile Factory®: Manufacturing node structures flexibly on site and independently of supply chains.

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AM for machine tool construction

IFW
Institut für Fertigungstechnik und Werkzeugmaschinen

Sponsored by:
German Federal Ministry for Economic Affairs and Energy (BMWi), Program for the Promotion of Industrial Collective Research (IGF)

Increasing productivity by unlocking lightweight potential

Additive Manufacturing makes it possible to produce individual and functionally optimized components, which would be challenging or impossible to produce using conventional manufacturing methods, with minimal material usage. This added value is highly relevant for machine tools, where a multitude of components need to be accelerated to execute machining processes. The use of functionally optimized components with a low mass would reduce acceleration times and consequently increase productivity.

For this reason, the Fraunhofer IAPT systematically examines the applicability of Additive Manufacturing to machine tools for enhancing productivity in the AddSpin project (IGF project 20276 N). In collaboration with the Institute of Production Engineering and Machine Tools IFW at Leibniz University Hannover, selected components of the tool spindle clamping system of a Swiss-type lathe were topology-optimized, additively manufactured, and subsequently installed and tested in the machine. Targeted lightweight design reduced the mass of the components by up to 67%, leading to a 55% reduction in the mass inertia of the entire rotating system.

The final investigations of the optimized components in the Swiss-type lathe showed that the topology optimization of just four components could reduce acceleration and deceleration times by 20%. For the reference components used in the project, this translates to potential savings of up to 10% of the overall machining time.

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The targeted lightweight design was able to reduce the mass of the components by up to 67% and consequently decrease the inertia of the entire rotating system by 55%.«

Optimized clamping system of a Swiss-type lathe

Curators

Where do you see Fraunhofer IAPT in five years?«

»In five years, I envision Fraunhofer IAPT in the role of an innovation pioneer, consistently updating AM technology to meet the needs of its customers. With the continuous expansion of its extensive production capacities across the entire AM process chain, it will provide innovative end-to-end solutions for Additive Manufacturing. This positions Fraunhofer IAPT as a leading institute in the application of the latest AM technologies.«

Dr. Tina Schlingmann
Regional Director EMEA: DACH & Benelux,
EOS GmbH Electro Optical Systems

»With the planned structural expansions, I see the IAPT as one of the globally leading institutes for Additive Manufacturing in five years. It will be the focal point for German industry, implementing innovative products in the fields of renewable energy, e-mobility and medicine with the support of the IAPT. In doing so, the IAPT will significantly support, expand and secure the industrial location of Germany and specifically Hamburg.«

Dr. Klaus Kleine
Director Laser Application,
Coherent Inc., USA

»For me, Fraunhofer IAPT has the potential to become one of the leading European institutes for the industrialization of Additive Manufacturing technologies such as L-PBF, LMD, or BJ in the next five years. Considering its expertise in data analytics and data science, a significant leap in terms of process optimization and stability, as well as intelligent quality assurance, is possible.«

Christoph Hauck
Member of the Executive Board,
toolcraft AG

»Additive Manufacturing provides a key tool for sustainable industrial production. The IAPT plays a significant role here due to its close collaboration with industrial companies, serving as one of the protagonists, a ‘go-to’ partner, and a talent pool for the future workforce. I wish the IAPT that the IAMHH® initiative becomes a flagship initiative with global recognition and a significant impact on scaling Additive Manufacturing in the economic landscape of Germany.«

Dr. Karsten Heuser
Vice President Additive Manufacturing,
Siemens AG

»The potentials of Additive Manufacturing are enormous and far from being fully explored. For this, we need the IAPT to advance technologies and materials qualitatively, enabling corresponding applications in industry. In the coming years, the IAPT will expand its pioneering role in northern Germany and open up additional sectors for Additive Manufacturing.«

Stefanie Brickwede
Managing Director,
Mobility goes Additive e. V.

Additional Curators in the Reporting Period:

Klaus von Lepel
Head of Unit Research / W2,
Free and Hanseatic City of Hamburg (BWFGB) Authority for Science, Research and Equality of the Free and Hanseatic City of Hamburg
Ministry for Science and Research

Angela Titzrath
Chief Executive Officer
Hamburger Hafen und Logistik Aktiengesellschaft (Port of Hamburg and Logistics)

Prof. Dr. Andreas Timm-Giel
President
Hamburg University of Technology

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- BUHR, Malte, André FISCHER, Karl GRITZ, Peter SCHLÜTER, Bohdan VYKHTAR and Julian U. WEBER, 2022. Mobile Refurbishment by Robot-Based Additive Manufacturing. In: *IEEE 5th International Conference on Industrial Cyber-Physical Systems (ICPS).*

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- BLUNK, Heiko and Niklas HUBER, 2022. Resource-efficient sintering supports for the metal binder jetting process. In: *Innovative Product Development by Additive Manufacturing; IPDAM 2022.*

As of December 2022

Project »FingerKIt«: Patent application for the implant design based on X-ray images.

Patents Granted

2021

Method for Manufacturing a Component from an Aluminum Alloy

DE102019214740B3
Inventors: Caba, Stefan; Hillebrecht, Martin; Jäger, Sebastian; Knoop, Daniel; Lutz, Andreas; Mais, Bernhard

Electronic Module with Additively Manufactured Heat Sink

EP000003116292B1
Inventors: Beckmann, Frank; Emmelmann, Claus; Gombert, Madeleine; Gomez Davila, Blas; Hillebrecht, Martin; Spiegel, Alexander

Device and Method for Determining the Position and/or Orientation of a Workpiece

EP00000371019 9B1
Inventors: Buhr, Malte; Emmelmann, Claus; Möller, Mauritz

In addition, there were a total of 11 patent applications.

2022

Material-Optimized Junction Node

US 2020/0406984 A1
Inventors: Hasenauer, Thomas; Orloff, Sven; Hillebrecht, Martin; Emmelmann, Claus; Beckmann, Frank

In addition, there were a total of 15 patent applications.

Cooperations

Fraunhofer Cooperations

Fraunhofer Group for Production
Fraunhofer IAPT is a member of the Fraunhofer Group for Production (www.produktion.fraunhofer.de), a cooperative association of eleven Fraunhofer institutes and facilities. Established in 1988, the alliance aims to conduct collaborative production-related research and development. Utilizing the latest insights from production, engineering sciences, and informatics, the alliance provides a spectrum of services covering the entire product life cycle and value chain. Research and industry are closely and interdisciplinarily connected within the alliance. By bundling the diverse competencies and experiences of its members, comprehensive system solutions can be offered to German and international clients, making companies ready for the »production of the future«. Fraunhofer IAPT contributes its expertise in industrial and autonomous solutions for additive production technologies as an essential component of the alliance.

Fraunhofer Competence Field Additive Manufacturing
The Fraunhofer Competence Field Additive Manufacturing (www.additiv.fraunhofer.de) integrates nineteen institutes throughout Germany, covering the entire process chain of Additive Manufacturing. This includes the development, application and implementation of Additive Manufacturing methods and processes. The offerings target industries such as handling and assembly, medical technology, mobility, microsystems technology, and toolmaking but are also applicable across industries. Since its establishment in 2018, Fraunhofer IAPT has been a member of the Fraunhofer Competence Field Additive Manufacturing, contributing to jointly offered contract research projects and exhibition appearances.

Scientific Cooperations

Medical Center Hamburg-Eppendorf (UKE)
The Life Science department of Fraunhofer IAPT collaborates on various research topics with the Department of Oral, Maxillofacial and Facial Plastic Surgery (MKG) at the Medical Center Hamburg-Eppendorf (UKE). The goal is to integrate Additive Manufacturing into the clinical workflow and further develop it for application-specific purposes.

Various research focuses at UKE are coordinated by Prof. Dr. med. Dr. med. dent. Ralf Smeets, who leads the section »Regenerative Orofacial Medicine« in the MKG department. Prof. Smeets also serves in an advisory role at Fraunhofer IAPT, aiming to translate the ideas of medical professionals into the language of engineers. Joint development activities range from digital image data acquisition and processing to the application of AI for the reconstruction of medical anatomies and the development of new additive processes and materials, such as processing silicones or biological bone replacement materials. In this context, an initial trilateral research project was approved in 2021 in collaboration with Helmut Schmidt University Hamburg (HSU), focusing on AI-assisted data generation, optimization of the Additive Manufacturing process, and the development of a qualification and certification concept for medical products.

Helmut Schmidt University
University of the Federal Armed Forces Hamburg (HSU/UniBw H)

The Institute of Computer Science in Mechanical Engineering at Helmut Schmidt University Hamburg (HSU) (www.hsu-hh.de) collaborates closely with Fraunhofer IAPT in a strategic partnership. The chair, led by Prof. Dr. Oliver Niggemann, and its over 20 staff members possess extensive expertise in methods of machine learning (ML) and artificial intelligence (AI) for cybe-physical production systems. Joint development activities leverage the competencies of both research institutions and drive the digitization of Additive Manufacturing. Interdisciplinary projects facilitate active knowledge transfer between the IAPT and HSU staff.

The collaboration aims to increasingly explore joint projects in the context of HSU and other Hamburg partners in order to strengthen the local research landscape.

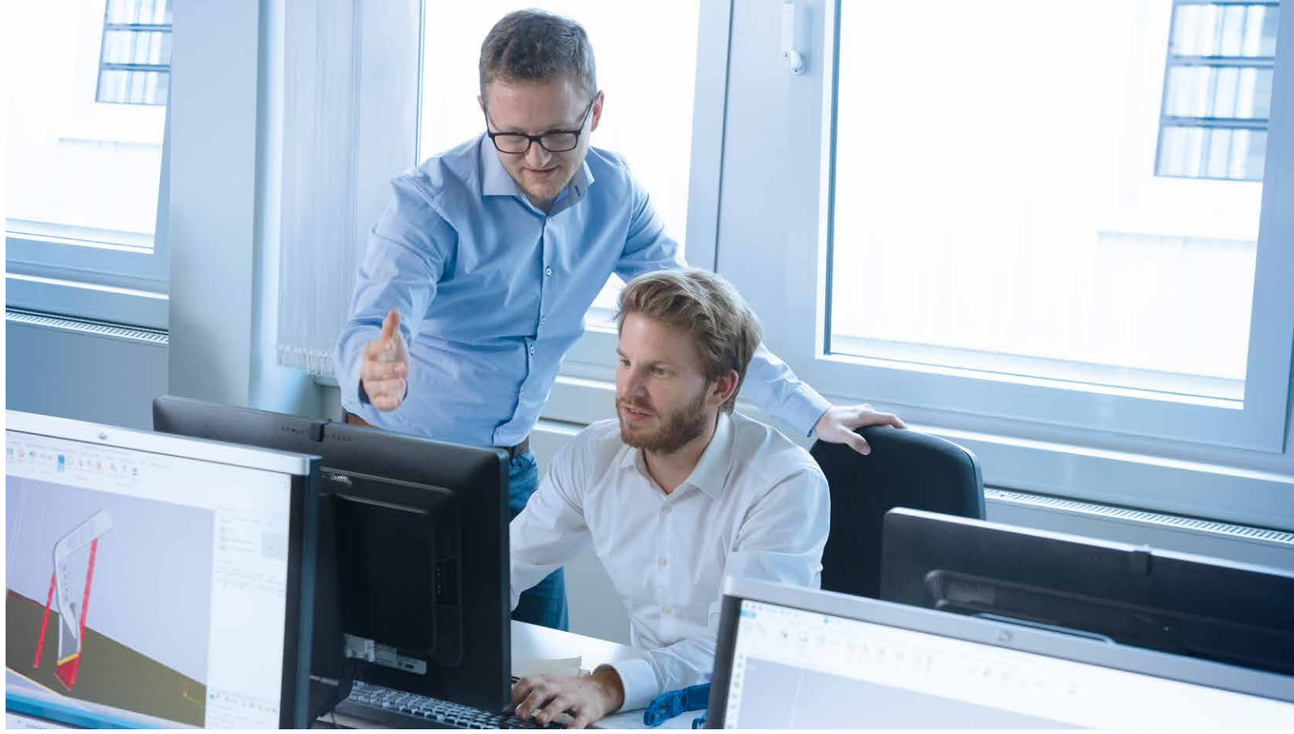
Networks

Additive Alliance®
The Additive Alliance® of Fraunhofer IAPT organizes events and provides companies with insights into the opportunities of Additive Manufacturing. The events combine presentations and training from Fraunhofer IAPT with user reports and networking opportunities. Additionally, Additive Alliance® members vote on three research projects each year, which Fraunhofer IAPT implements. The results are shared with member companies through presentations and printed reports called Deep Dives.

3D-Druck Nord
3D-Druck Nord is the 3D printing network of the metropolitan region of Hamburg, dedicated to advancing the development of Additive Manufacturing in northern Germany. Founded in 2018 by the Hamburg Chamber of Commerce under the name »3DMRHH,« the network resumed its activities in August 2021 after a pandemic-related hiatus, now with a new name and new administration but the same goals.

Fraunhofer IAPT collaborates with Hamburg partners including Fehrmann Alloys, DESY, Hamburg Chamber of Commerce, Hamburg Chamber of Crafts, Industrial Association Hamburg IVH, as well as the Lübeck Chamber of Commerce, Lübeck Technology Center TZL and Fraunhofer IMTE. They connect science and businesses in the AM industry in northern Germany, facilitate exchange and enhance the visibility of the Hamburg metropolitan region as an internationally leading competence region in Additive Manufacturing.

Mobility goes Additive
As a founding member, Fraunhofer IAPT has been actively involved in the Mobility goes Additive e. V. network for over five years. Originating from an initiative by Deutsche Bahn, the network aims to industrialize Additive Manufacturing, especially for the mobility sector. Fraunhofer IAPT leads the »Education« working group, probably the most significant international 3D printing network, and develops concepts for technology-related training and education. Additionally, Fraunhofer IAPT supports the approval of additively manufactured components for rail transport and the development of new materials, such as fire-resistant ones, in the »Approval« and »Materials« working groups. Since 2019, Fraunhofer IAPT has also been active in the newly formed sister network »Medical goes Additive,« striving to identify and implement innovative medical applications for 3D printing.



Innovations for the industrialization of Additive Manufacturing

MN3D
Fraunhofer IAPT is a member of the steering group in the Maritime Network for 3D Printing – MN3D. Its members aim to unlock the potentials of Additive Manufacturing for shipbuilding and other maritime applications and to initiate joint research and development projects in this context. The MN3D network closely collaborates with the Maritime Cluster Northern Germany e. V. (MCN).

Industrial Cooperations

3D Spark GmbH
The company 3D Spark (www.3DSpark.de) was founded in June 2021 by three former employees of Fraunhofer IAPT. The company develops and sells software for identifying and quantifying cost savings in manufacturing at companies. CAD data, ERP data and technical drawings are analyzed using AI-driven algorithms to precisely identify components that can be manufactured more cost-effectively with 3D printing than with previously used methods. Fraunhofer IAPT and 3D Spark collaborate in the field of software-based »part screenings« to jointly explore new applications for 3D printing and to optimally advise customers on the introduction of 3D printing.

AMPOWER GmbH & Co. KG
Fraunhofer IAPT has a close and longstanding partnership with the Hamburg-based consulting firm AMPOWER (https://am-power.de). In a joint training concept, both institutions combine their expertise in binder jet 3D printing, offering a hands-on workshop that integrates the comprehensive technology and market knowledge of AMPOWER with the process and machine knowledge of Fraunhofer IAPT for the benefit of customers. Additionally, joint projects include the development of design guidelines and qualification strategies for this process.

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Sources

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