Fraunhofer
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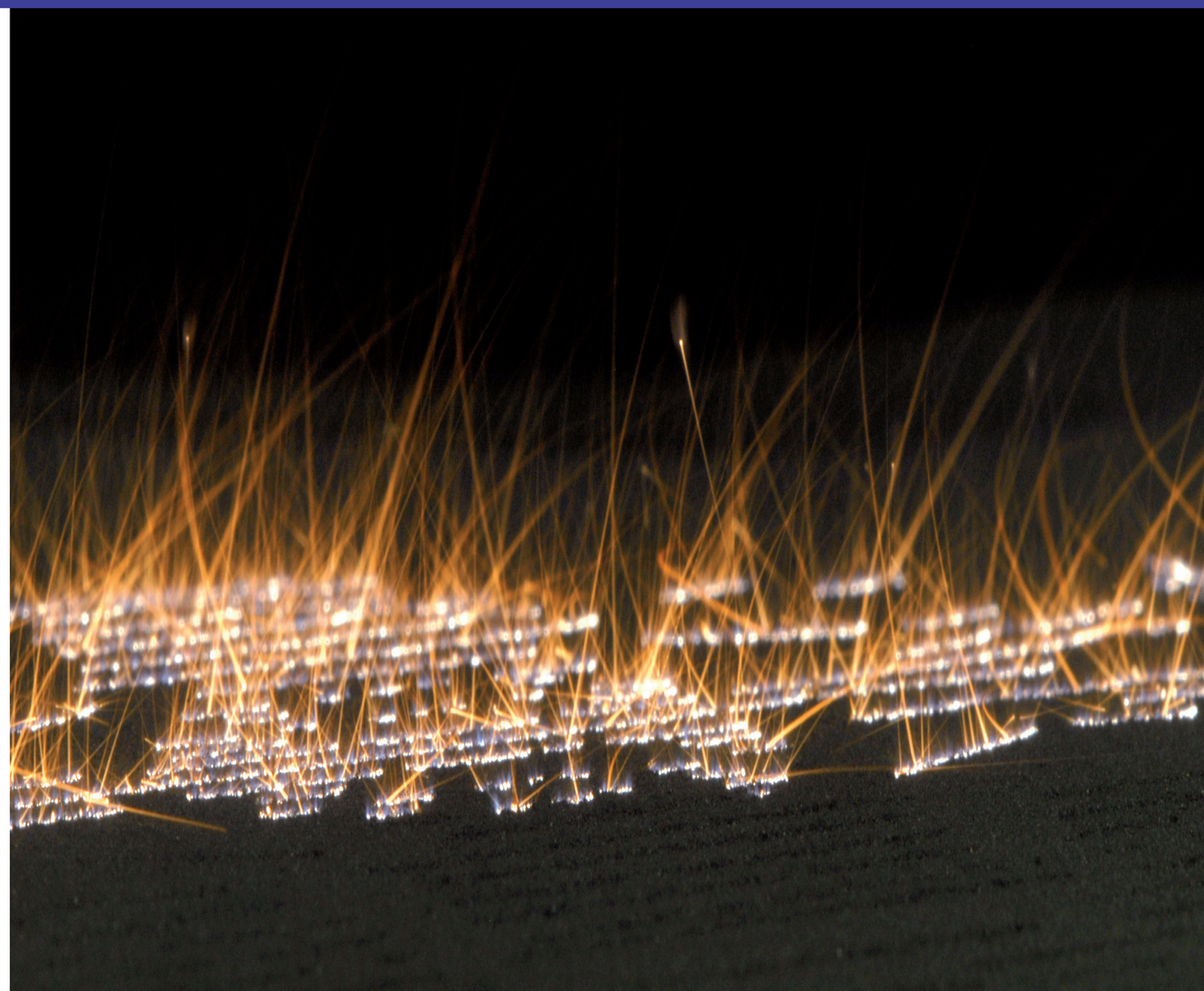
FRAUNHOFER INSTITUTE FOR LASER TECHNOLOGY ILT

LASER POWDER BED FUSION



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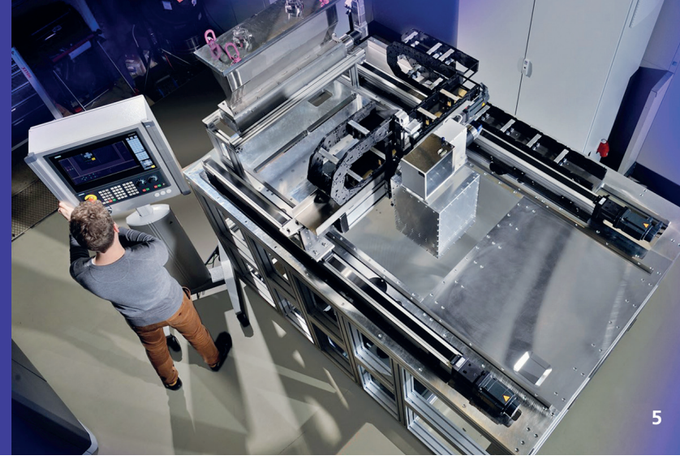
Fraunhofer Institute for Laser Technology ILT

The Fraunhofer Institute for Laser Technology ILT is one of the most important development and contract research institutes in laser development and application worldwide. Its activities encompass a wide range of areas such as developing new laser beam sources and components, laser-based metrology, testing technology and industrial laser processes. This includes laser cutting, ablation, drilling, welding and soldering as well as surface treatment, micro processing and additive manufacturing. Furthermore, Fraunhofer ILT develops photonic components and beam sources for quantum technology.

Overall, Fraunhofer ILT is active in the fields of laser plant technology, digitalization, process monitoring and control, simulation and modeling, AI in laser technology and in the entire system technology. We offer feasibility studies, process qualification and laser integration in customized manufacturing lines. The institute focuses on research and development for industrial and societal challenges in the areas of health, safety, communication, production, mobility, energy and environment. Fraunhofer ILT is integrated into the Fraunhofer Gesellschaft.

Subject to alterations in specifications and other technical information. 11/2021.



LASER POWDER BED FUSION

The Fraunhofer Institute for Laser Technology ILT has over 25 years of experience in the additive manufacturing of metallic components using Laser Powder Bed Fusion (LPBF), also known as Selective Laser Melting (SLM). This expertise makes it one of the world's leading research institutes in this field. Our comprehensive equipment and combined know-how in the areas of laser beam source and optics development as well as process and system development form the basis for your applications and innovations.

Potential of LPBF in Production

Since the part is built up layer-by-layer in toolless production, a three-dimensional manufacturing task can be reduced to two dimensions. The manufacturing costs do not depend upon the geometric complexity, but roughly upon the volume of the component to be built. Thus, LPBF provides a range of systematic advantages when it is com-pared to conventional manufacturing processes such as primary shaping or machining:

Complexity for free

LBPF makes it possible to manufacture more complex component designs and monolithic assemblies without additional manufacturing costs. For example, LPBF can be used to integrate additional functions or internal lightweight structures into components as well as to manufacture topology-optimized components.

Individualization for free

With the LPBF process it is possible to manufacture individualized components with different geometries simultaneously within one process.

Time to Market

Thanks to LPBF, prototypes can be built in small batches with series-identical material properties in a very short time. A systematic advantage is that it accelerates the development time by an increasing number of feasible iteration cycles, resulting in a shortened time until the market launch of a new product.

Digital Process Chain

To establish LPBF as an economical manufacturing process and to use the advantages in production, research needs to take an integrated view of the overall process chain, from component design, via LPBF process and system engineering all the way to final post-processing.

When digitalization of physical components (Digital Twin) is applied, it is possible to define component properties before production and implement them in the physical component directly using LPBF. This results in greater agility along the entire product life cycle.

LPBF at Fraunhofer ILT

Fraunhofer ILT developed the LPBF process in the middle of the nineties, and since then has constantly refined it in close cooperation with leading industry companies and research institutions while taking the whole process chain into consideration. Thanks to our expertise and many years of experience, our experts can assist you individually from the very first idea, through feasibility studies, process and system development all the way to implementing the results into your production chain. You can fall back upon our comprehensive range of equipment, consisting of various commercial systems and highly flexible laboratory systems, but also upon our know-how in the area of laser beam source and optics development.

Thanks to our close cooperation with other Fraunhofer Institutes, the FH Aachen University of Applied Sciences, the University Hospital RWTH Aachen, the RWTH Aachen University, the Aachen Center for Additive Manufacturing (ACAM) as well as the International Center for Turbomachinery Manufacturing (ICTM), you can also profit from the bundled competence this location, Aachen, offers in the sector of additive manufacturing.

Range of Services

Among other things, the services ILT offers include the following R&D tasks along the entire process chain:

- Design of functionally adapted components
- Characterization of powder materials
- Development of components and complete machines for LPBF (Systems Engineering)
- Process monitoring for quality assurance
- Adapted process control to increase productivity
- Life cycle assessment of the entire process chain (sustainability)
- Characterization of the component and material properties
- Feasibility studies as well as the production of prototypes and very small series
- Market studies and consulting
- Workshops and seminars in the field of additive manufacturing

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1 Miniature octopus with moving components made using the LPBF process.
2 Steering knuckle with integrated load-adapted grid structures.
3 Processing pure copper with green laser radiation.
4 Additively manufactured turbomachinery component at MAN Diesel & Turbo SE.
5 LPBF laboratory system for large metal components (machine housing not shown).