

FROM 3D PRINTED PART TO INDUSTRIAL COMPONENT

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Additive manufacturing enables resource-efficient production of complex geometries with integrated functions and structures. However, printed parts are initially only semi-finished products. Only through appropriate post-processing do they become ready for assembly, durable, and suitable for industrial use. At Formnext 2025 in Frankfurt (Hall 11, Booth D31), the Fraunhofer Production Alliance focuses precisely on this interface: Seven participating Fraunhofer institutes demonstrate how printed blanks become functional industrial components – from surface finishing to automated support-structure removal.

Post-Processing Technologies You Can Touch

A special exhibit showcases the diversity of post-processing technologies: a turtle manufactured in a powder bed. Its shell consists of several segments, each post-processed differently – from milling, glass-bead blasting and sandblasting, plasma polishing, vibratory and drag finishing, laser structuring to selective coating and electrochemical methods. Visitors can feel the different surface finishes with their hands. The exhibit also illustrates automated support structure removal and the additive manufacturing of multi-material components, including their post-processing.

From Mirror-Smooth to Functionalized

Post-processing covers a wide range. Mechanical methods such as milling, sandblasting, or drag finishing smooth surfaces and ensure dimensional accuracy, which is crucial for component assembly. Plasma processes clean, polish, and improve adhesion, for example when bonding metals with plastics. Laser structuring creates micro- and nanostructures to functionalize surfaces, such as guiding liquids or reducing friction. Selective coatings also enhance functionality, enabling plastic parts to become electrically conductive, chemically resistant, or to exhibit specific optical properties.

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Interior Surfaces – A Special Challenge

External surfaces are relatively easy to process. It becomes more difficult with internal channels, such as those used for cooling tools, in turbines, or heat exchangers. At Formnext, the participating Fraunhofer institutes demonstrate how flow polishing and electrochemical processes can precisely refine even these hard-to-reach areas. This opens up applications where additive manufacturing has previously reached its limits. This is a significant advancement, especially for industries such as aerospace, energy technology, or toolmaking.

Automation for Series Production

To make additive manufacturing and post-processing economically viable and reproducible, the alliance relies on automated processes: Robot-assisted systems remove support structures quickly, reliably, and error-free. This reduces process times, improves quality, and makes additive manufacturing suitable for series production. Fraunhofer thus addresses a key concern of industry: Consistent quality at lower costs.

Repair Instead of Replacement

Post-processing not only means refinement but also repair. Repair methods for plastic parts extend the lifespan of components that would otherwise need to be replaced. Combined with the use of recycled materials, this contributes to a circular economy and resource conservation without compromising quality. Thus, additive manufacturing contributes not only technologically but also ecologically to the future viability of production.

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Fig. 1: Additive manufacturing processes typically produce semi-finished products that only become high-quality end products through post-processing. The turtle at the Fraunhofer exhibition booth makes this principle visible and tangible. © Fraunhofer IPT

Technology examples from the following partner institutes of the Fraunhofer Group for Production will be presented:

- Fraunhofer Research Institution for Additive Manufacturing Technologies IAPT
- Fraunhofer Institute for Casting, Composite and Processing Technology IGCV
- Fraunhofer Institute for Manufacturing Engineering and Automation IPA
- Fraunhofer Institute for Production Systems and Design Technology IPK
- Fraunhofer Institute for Production Technology IPT
- Fraunhofer Institute for Surface Engineering and Thin Films IST
- Fraunhofer Institute for Machine Tools and Forming Technology IWU

The Fraunhofer Group for Production brings together the expertise of 13 Fraunhofer institutes. Together, they develop solutions along the entire value chain – from digitalization and networking to hybrid manufacturing chains, product development, quality assurance, and post-processing, all the way to training and material flow. In the field of additive manufacturing, the alliance covers both upstream and downstream process steps. The exhibition at Formnext 2025 places a particular focus on post-processing: from surface finishing and functional coating to automated support structure removal and the processing of internal channels, all the way to sustainable repair methods.