

TOPIC AREA "COMPLEX CASTINGS"

Innovative and demand-appropriate solutions

The area of "Complex Castings" within the Casting Technology and Lightweight Construction department at Fraunhofer IFAM conducts **research and development** on innovative and **demand-appropriate solutions** for casting technology with its highly qualified and experienced experts as well as process and plant engineering facilities for **high and low-pressure casting, lost foam casting, investment casting, and sand casting.**

A focus lies on issues in the manufacture of **castings with a complex geometry** which cannot be produced conventionally with casting due to a lack of demoldability, complicated undercuts or integrated hollow spaces. Depending on the process, **lost core technologies**, the **development of specific tool concepts**, and the **optimization and further development of the casting process** itself can also come into play.

A particular strength of the workgroup is the **interdepartmental linking** of the competencies with the technological and scientific know-how of **neighboring fields**. This occurs in close cooperation with the experts of the seven core competencies of Fraunhofer IFAM or with external partners from industry and research. Research is conducted, among other things, on non-stick coatings for casting tools, new material concepts for lost cores, and the use of virtual and augmented reality in casting technology.

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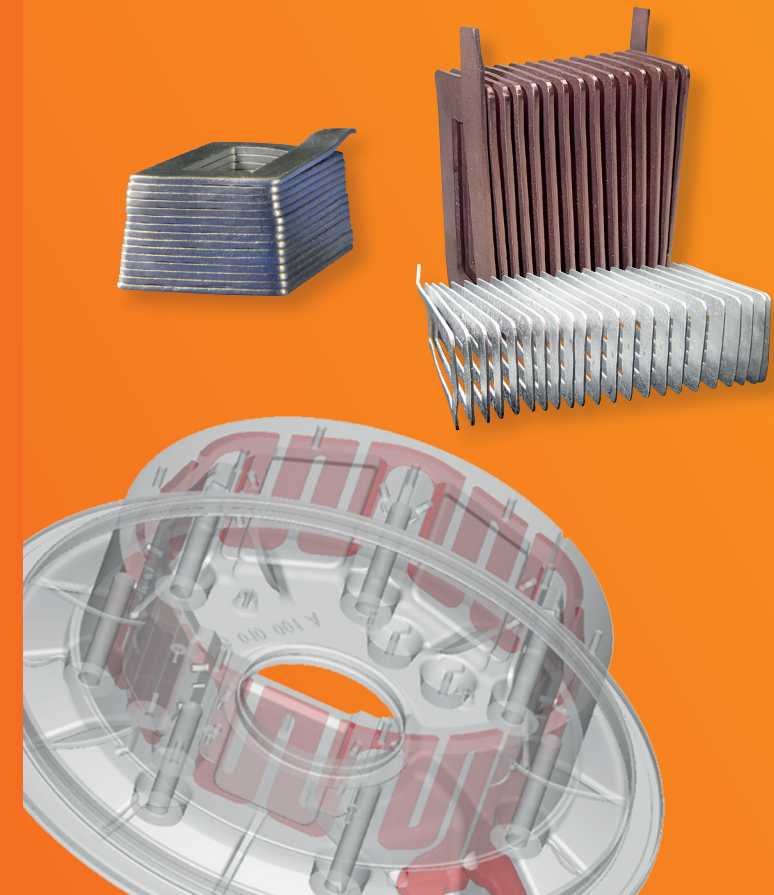
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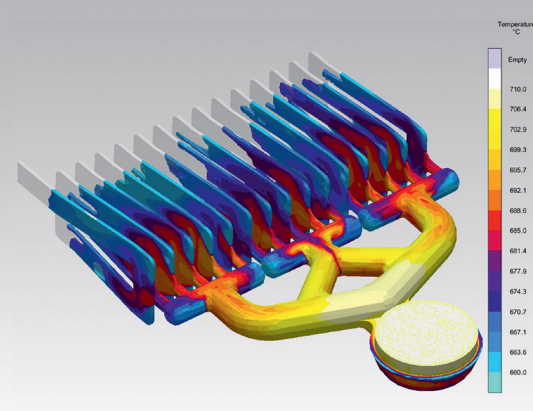
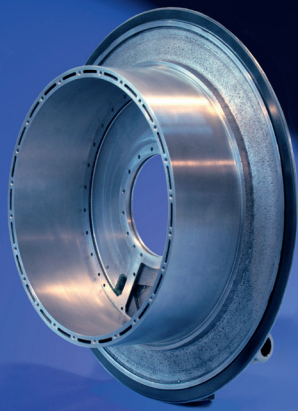
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CASTING TECHNOLOGY AND LIGHTWEIGHT CONSTRUCTION

TOPIC AREA "COMPLEX CASTINGS"





Focus Points in the Topic Area “Complex Castings”

Process and product development

- The development of complex components as well as the respective tool concepts for the cost-effective manufacture of geometrically demanding castings.

Coating systems

- Development of non-stick coatings (e.g., plasma coatings for release-agent-free manufacture of wax parts for investment casting)

Thin-walled castings

- Development of large series appropriate casting processes for thin-walled castings made of stainless steel, cast iron, and non-ferrous metals

Core and binder technologies

- Optimization and new development of binder systems for the manufacture of lost cores and molds made of new and innovative shaping materials
- Low-pressure casting of salt cores for the manufacture of complex castings using high-pressure and gravity die casting

Simulation / digitalization / Industry 4.0

- Overarching simulation approaches for the process optimization at both the series and component levels (digital twin, for example to minimize and compensate for warping)
- Virtual and augmented reality for the linking and visualizing of 3D data along the process chain
- Multiphase topology optimization for demand-appropriate design of multi-material components (MPTO)

From the concept to the product...

With our competencies in Casting Technology, Fraunhofer IFAM accompanies our industrial customers throughout the casting technology implementation of an idea from the concept to the first prototype to the final series-ready product. We have various casting processes and materials ready to address any query.

... in our one-stop shop!

The Casting Technology and Lightweight Construction department can illustrate the entire process chain from the concept phase via the casting design to the tool construction and the casting technological manufacture to the final metallographical and nondestructive testing.

Novel technology combinations

In addition to the conventional casting technological queries we also support our customers when it comes to reaching across technologies into manufacturing and materials technology. For this, project teams from various departments at Fraunhofer IFAM as well as other institutes of the Fraunhofer-Gesellschaft will come together to combine their expertise. Such topics as corrosion, surface treatment, paint and lacquer technology or adhesive bonding technology can be scientifically and practically addressed through our comprehensive network of research and development staff.

An overview of our services

- Technology consulting for the processes of high-pressure die-casting, low-pressure die-casting, lost foam casting and investment casting
- Experimental research and development
- Feasibility studies and market analyses
- Error and process analyses
- Quality testing and analytics

Our research topics

- Complex castings
- Castings for electric drives
- Hybrid casting and fiber integration
- Digitalization of castings through the integration of RFID transponders and sensors

Technological equipment

- HPDC: 660t BÜHLER SC/N 66 + 250t FRECH DAK 250-34
- LPDC: TEGISA I (50 liters melt volume)
- LPDC: TEGISA II (110 liters melt volume)
- Investment casting: INDUTHERM VC 650 + INDUTHERM VC 3000 D
- Wax injection casting: ModTech C20
- Lost foam casting: VULCAN compaction unit Vector-Flo

Analytics

- X-ray and computer tomography: YXLON MU-2000
- Optical measurement system: GOM ATOS 3 TripleScan
- Complete range of metallographical testing at Fraunhofer IFAM