Additively manufactured heat exchangers: Industrial production, safe operation

About this project

AMDECA

Additively manufactured heat exchangers: Industrial production, safe operation

Markets:

Material: Aluminium, Steel, Others (Nickel), Oxidic ceramics

This project is funded by the Technology Transfer Programme Leichtbau (TTP LB) of the Federal Ministry of Economics and Energy.

Technology Transfer Program Leichtbau

Additively manufactured heat exchangers: Industrial production, safe operation

About this project

Context

Industry, energy supply and transport must significantly reduce their emissions in the coming years. This requires technologies that utilise energy efficiently and save resources. Heat exchangers play a key role here. They transfer heat between two media without mixing them and thus help determine the efficiency of many systems.

Efficient heat exchangers reduce energy requirements and therefore also CO2 emissions. At the same time, the demands on these components are increasing. They need to be compact, lightweight, efficient and durable. However, conventional manufacturing processes can only produce such complex structures to a limited extent.

Additive manufacturing opens up new possibilities here. It allows functionally optimised geometries and the targeted use of materials. Nevertheless, companies have hardly used it in demanding applications to date. Reliable data on materials, service life and media compatibility is often still lacking. The quality assurance of complex, thin-walled structures is also challenging. This is precisely where the AMDECA project team comes in.

Purpose

In the research project, the project team wants to prove that highly efficient and application-adapted heat exchangers can be additively manufactured - on an industrial scale. It also wants to prove their safe operation. The focus is therefore not only on the development of individual components, but also on providing end-to-end proof of production, quality and use under real-life conditions.

The heat exchangers are intended for applications in decentralised energy supply, aviation and industry. There they have to combine high efficiency, low mass and a compact design. The project partners are thus creating the basis for industrialising additive manufacturing for these demanding applications and adapting heat exchangers specifically to different operating conditions.

Additively manufactured heat exchangers: Industrial production, safe operation

About this project

Procedure

Firstly, the project partners define what the heat exchangers need to achieve in the various applications. On this basis, they design new geometries and utilise the possibilities of additive manufacturing in a targeted manner. In this way, the team aims to improve heat transfer, reduce installation space and utilise material precisely.

At the same time, the researchers are developing suitable manufacturing processes for the components. They select materials and test how they behave under real operating conditions.
The project partners are also looking at contact with various media. They rely on non-destructive computer tomography for quality assurance. In this way, the consortium aims to recognise internal defects at an early stage and avoid faulty parts in production.
The partners then produce demonstrators and test them in energy conversion systems. In doing so, they check whether the heat exchangers achieve the required performance, efficiency and operational reliability in conjunction with the overall system. At the same time, the team continuously assesses the impact of the new components on resource consumption and the environmental footprint.

Funding duration:

Funding sign:	03LB1013	**Funding amount:**	EUR 3.7 million

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB1013A - AMDECA in the federal funding catalogue

Additively manufactured heat exchangers: Industrial production, safe operation

Project coordination

Contact:

Ms Dr. Friederike Lange

+49 162 4197436

friederike.lange@siemens-energy.com

Organisation:

Siemens Energy Global GmbH & Co KG

Huttenstr. 12
10553 Berlin
Berlin
Germany

www.siemens-energy.com

English (EN){{ Projektpartner }}

Lightweighting classification

	Realisation
Offer	
Products Machines and plants, Materials	✓
Services & consulting Training	✓

Additively manufactured heat exchangers: Industrial production, safe operation

Lightweighting classification

	Realisation
Field of technology	
Design & layout Lightweight manufacturing, Lightweight material construction	✓
Functional integration	
Measuring and testing technology Component and part analysis, Materials analysis, Destructive analysis, Non-destructive analysis	✓
Modelling and simulation Life-cycle analysis, Processes, Materials	✓
Plant construction & automation	
Recycling technologies Recycling	✓
Manufacturing process	
Additive manufacturing 3D printing, Selective laser melting (SLM, LPBF, ...)	✓
Coating (surface engineering)	
Fibre composite technology	
Forming	
Joining	
Material property alteration	
Primary forming	
Processing and separating	
Textile technology	

Additively manufactured heat exchangers: Industrial production, safe operation

Lightweighting classification

	Realisation
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites	
Fibres	
Functional materials	
Metals Aluminium, Steel, Others (Nickel)	✓
Plastics	
Structural ceramics Oxidic ceramics	✓
(Technical) textiles	