Antistatic pipes for aviation: composite materials replace metal

About this project

AntiStatic

Antistatic pipes for aviation: composite materials replace metal

Markets:

Material: Glass fibres, Others (Antistatic materials), Meshes, Glass-fiber reinforced plastics (GFRP)

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

Technology Transfer Program Leichtbau

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Context

In aviation, pipework systems for fuel, hydraulics and ventilation are essential. Currently, they are mostly made of metal, which leads to high weight and limited design freedom. Composite materials offer great potential here: they are lighter, corrosion-resistant and allow greater design freedom. However, they do not yet fulfil all requirements, particularly with regard to electrical conductivity and the economical production of complex pipe geometries. Previous solutions have reached their limits when it comes to combining functionality, safety and efficiency. This is where the AntiStatic research project comes in and searches for a new technological solution.

Purpose

The project team wants to develop antistatic cable systems made of composite materials that can replace conventional metal pipes. The innovation lies in the combination of low weight, high mechanical stability and electrical conductivity. The pipes are to include both straight and curved sections and fulfil specific requirements of the aviation industry.
The focus is on resource-saving production and a modular design of the piping system. By using this technology, weight savings of up to 50 per cent could be achieved, thereby significantly reducing CO# emissions in aviation.

Procedure

The project team has combined the manufacturing processes of braided pultrusion and braided RTM (resin transfer moulding). Braid pultrusion is used to produce straight tubes that are particularly stable and lightweight thanks to continuous production. The braided RTM process is used for bent pipe sections, which allows the production of complex geometries.
The researchers have also developed a resin system that is filled with carbon nanotubes (CNT). This gives the components their antistatic properties without compromising their mechanical characteristics. The team then joined the individual tube segments together using a modular joining process. The researchers are now using a demonstrator to prove the practicality and efficiency of the developed technology.

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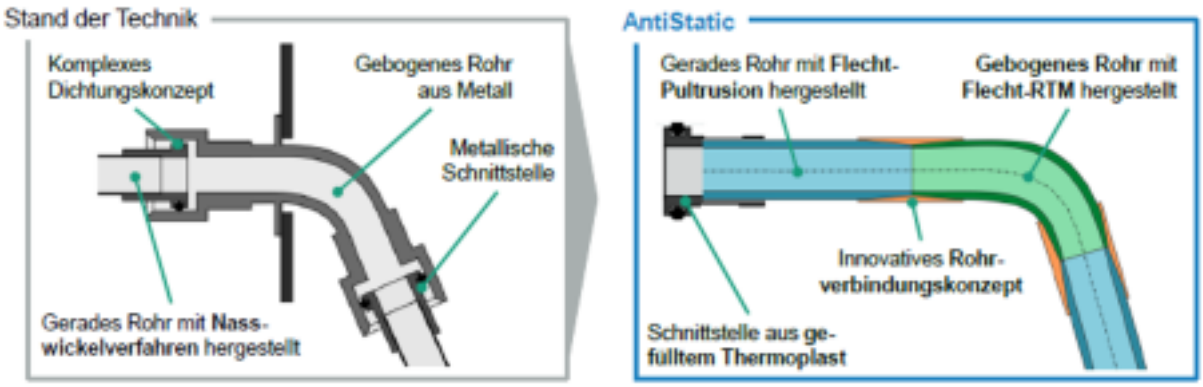

Funding duration:

Funding sign: 03LB2020 **Funding amount:** EUR 1.3 million

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB2020A - AntiStatic in the federal funding catalogue

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Project coordination

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English (EN){{ Projektpartner }}

Lightweighting classification

	Realisation
Offer	
Products Parts and components, Semi-finished parts, Systems and end products, Materials, Tools and moulds	✓
Services & consulting Testing and trials, Engineering, Prototyping, Validation, Simulation	✓

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Lightweighting classification

	Realisation
Field of technology	
Design & layout Lightweight manufacturing, Lightweight design, Hybrid structures, Lightweight construction concepts	✓
Functional integration Media conductivity, Material functionalisation	✓
Measuring and testing technology Component and part analysis, System analysis, Materials analysis, Destructive analysis, Non-destructive analysis	✓
Modelling and simulation Loads & stress, Life-cycle analysis, Multiphysics simulation, Optimisation, Processes, Structural mechanics, Materials, Reliability validation	✓
Plant construction & automation Plant construction, Automation technology, Robotics	✓
Recycling technologies	

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Lightweighting classification

	Realisation
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology Filament winding, Resin infusion process, Resin transfer moulding	✓
Forming	
Joining Adhesive bonding	✓
Material property alteration	
Primary forming Pultrusion	✓
Processing and separating Turning, Milling, Sawing	✓
Textile technology Braiding, Preforming	✓

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Lightweighting classification

	Realisation
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites Glass-fiber reinforced plastics (GFRP)	✓
Fibres Glass fibres	✓
Functional materials Others (Antistatic materials)	✓
Metals	
Plastics	
Structural ceramics	
(Technical) textiles Meshes	✓