



1 Carbon fiber preform in RTM mold.

2 Cured composite component in RTM mold.

LIGHTWEIGHT SOLUTIONS FOR AEROSPACE APPLICATIONS

Motivation/Objectives

Fiber-reinforced plastics are increasingly valued in the transport industry due to their very high specific material properties.

Legal requirements like the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) aim to achieve carbon neutral growth from 2020 onward and a 50% reduction in CO₂ emissions (compared to 2005) by 2050. To achieve this goal, the Technology Roadmap of the International Air Transport Association (IATA) focuses on the weight reduction of aircrafts by using composite structures for the wing and fuselage.

The increasing number of identical parts used in each aircraft means that large-scale production processes such as high-pressure resin transfer molding (HP-RTM) are increasingly used in the aerospace industry. The challenges, potential and future direction of the HP-RTM process have been investigated, using the example of a structural aircraft component.

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Research partners

- Advanced Composite Technology Center ACTC
 - First composite R&D center in China
 - Future aerospace composite component supplier
- Hufschmied Zerspanungssysteme GmbH
 - Milling specialist
 - Developed milling strategy and milling tools for postprocessing
- Alpex Technologies GmbH
 - Expert in RTM mold manufacturing
 - Manufactured RTM infiltration mold, preforming tool and milling fixture
- Huntsman Corporation
 - Leading resin supplier
 - Support in molding trials
 - Provision of aerospace resin system
- SGL Carbon
 - Leading fiber and fabric supplier
 - Provision of carbon fiber fabric
 - Support in preforming activities

Manufacturing method

- HP-RTM process chain, demonstrated at Fraunhofer ICT, transferred to ACTC
 - Well-known process for serial production in automotive industry
 - Suitable for achieving high quality standards in aviation industry
- Complexity of the part is feasible for automated processes
- Sequential stamp draping for preform manufacturing
- Ultrasonic trimming of the preform for highest accuracy
- Milling of the aircraft component with online quality control
- Geometry and RTM mold from SPARTA Project within the Austrian "TAKE OFF" program, provided by Alpex Technologies GmbH

Materials

- Fabric material from SGL Carbon:
 - +45° carbon fiber Biax-NCF with 600gsm
 - Fiber: SIGRAFIL® C T50-4.4/255-E100
- Resin material:
 - Huntsman Araldite® FAF2 system
 - Specially designed for RTM process
 - Fulfills the requirements of the aerospace industry

3 Draping of carbon fiber fabric in preforming mold.

4 Ultrasonic cutting of carbon fiber preform.

