CARIM
Deliverable
Report

Report title: D3.4 Manufactured Prototypes for homologation

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Project website:	www.carimproject.eu
Responsible partner:	**FHG**
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1. Introduction

In work package 3 of the CARIM project **– Setup of manufacturing process chain for carbon wheel –** the consortium is working on four tasks.

- In task 3.1 the preforming molds were designed and manufactured (see also the public deliverable *D3.1 – Preforming mold and manufacturing equipment ready to be taken into operation)*. Task 3.1 ended after the first project year in December of 2016.
- In task 3.2 the HP-RTM mold was designed and manufactured (see also the public deliverable *D3.2 – HP-RTM mold for manufacturing of the wheel ready to be taken into operation).* Task 3.2 was closed by end of the first project year 2016.
- In the first six months of the second project year the partners worked intensely on building up the process chain (task 3.3) to manufacture the CARIM prototype wheels.

Two trial sessions were carried out at Fraunhofer ICT. The main objective of the first trial session was the installation of the HP-RTM mold in the industrial-scale press at Fraunhofer ICT. During the above mentioned trial session, different preform configurations were tested for their geometrical fit and CFRP wheels were manufactured to test the molding concept.
The results show that the HP-RTM molding concept and the mold itself are working well and the preforms can be infiltrated at high flow rate in short time. The partners identified optimization potential at different process steps which were discussed and implemented for the second trial session. 22 wheels were manufactured in total and 10 are ready to be tested. The prototypes were infiltrated in less than 60s and demolded in a cycle time below 15 min.

2. Preforming and Assembling

The preforming process chain is the key to successfully manufacture CFRP wheels in good quality. Due to the complex wheel shape the preforms were separated into several sub-geometries which are assembled after the forming process.
After the first trial session some of the process steps were adapted and the equipment was partially adapted to obtain suitable preform quality for the molding process using HP-RTM. The process chain was proved for feasibility of automation in a serial production.

3. HP-RTM mold

The HP-RTM mold has been slightly reworked after the first trial session and fine-adjustments were carried out at partner Alpex. The main purpose was to increase the quality of the molded wheels. During the second trial session the prototype manufacturing was implemented successfully. Iterative parameter optimization was carried out to ensure fully impregnated wheels.

In total 22 prototypes were successfully manufactured and ten of the manufactured prototypes were made with the final molding parameter setup to obtain the prototypes required for the testing which is part of the work package 4. The prototypes were shipped to partner Riba to prepare them for the testing activity which will be carried out at partner TUEV (rolling, bending, impact) and Fraunhofer LBF (bi-axial ZWARP).

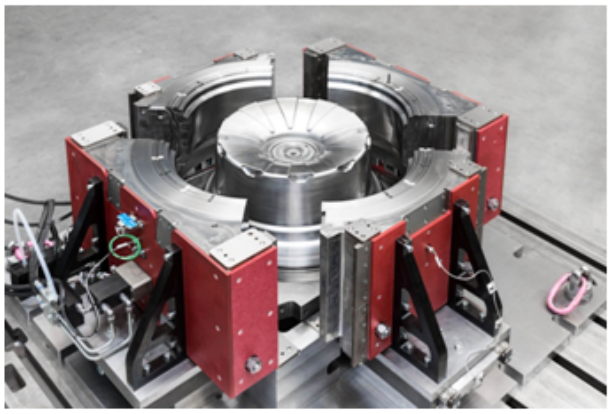

Figure 1: CARIM HP-RTM mold. Left side: Cross cut through CAD design. Right side: Lower part of the mold with open sliders

4. Summary

The process chain was successfully implemented and the required prototypes for the testing activities were manufactured.