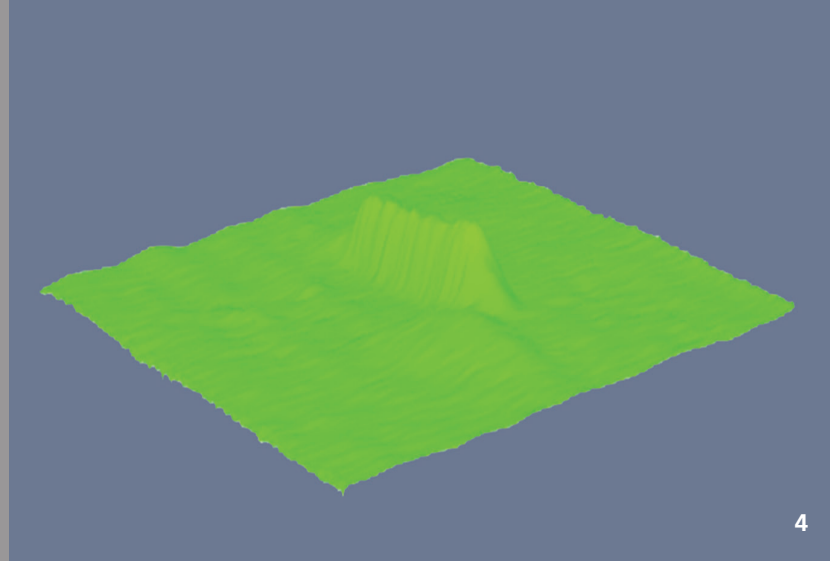


3



4

PROCESS MONITORING FOR THE LASER-BASED PRODUCTION OF CFRP COMPONENTS

Task

The market for components made of fiber-reinforced plastics is growing steadily as are the requirements for automated, flexible, energy-efficient and environmentally friendly manufacturing processes to produce them. By developing a laser-based tape winding system with easy-to-use software for process planning and inline quality monitoring, Fraunhofer ILT has addressed this challenge. In this process, tapes made of fiber composite materials are automatically welded using a diode laser; the quality of the tapes welded in the multi-layer process is monitored inline directly after the welding process in order to immediately recognize an insufficient connection of the tapes. The aim is to enable the application of process monitoring without special expertise.

Method

In the project »ambliFibre«, Fraunhofer ILT has developed an inline monitoring system for tape winding and implemented the necessary interfaces for its integration into the tape winding system. For process monitoring, defined embossments in the output tape will be recognized after the welding process to decide between different consolidation qualities. The embossments are recorded with optical, non-contact measurement methods such as, for example, thermography and/or laser triangulation. A particular challenge is the robust recognition of the 300 µm high embossment at a process speed of 600 to 800 mm/s.

Results

In the first stationary tests, the measuring principles active thermography and laser triangulation have already been successfully applied and confirmed for the fiber composite material CFRP. The next step will be to examine which of the methods is more suitable for inline surveying and how the evaluation and storage of the measured data can be carried out.

Applications

It is expected that the application of the »ambliFibre« results can be successfully used in many areas for the processing of fiber-reinforced plastics. In particular, the process can be used in the production of heavy-duty gas and oil lines as well as high-pressure vessels for the energy industry and of ultralight CFRP components for the aerospace technology.

The work has been funded as part of the EU project »ambliFibre« under grant number 678875.

Contact

Andrea Lanfermann M.Sc.
Telephone +49 241 8906-366
andrea.lanfermann@ilt.fraunhofer.de

Dipl.-Ing. Peter Abels
Telephone +49 241 8906-428
peter.abels@ilt.fraunhofer.de

3 Thermographic image of an embossed CFRP tape.

4. Image of an embossed CFRP tape with a laser-triangulation sensor.