

Machine Design and Automation in Composite Manufacturing

The connection of research and industry

Mechanical Engineering and Automation in Composite Manufacturing deals with systems engineering in production. Thereby we deal with sensor and actuator technology and how these can be used in the combination. This involves the expansion of existing systems or the design of new customized ones. The communication and the interface of the systems must be coordinated so that all individual parts can interact. When using complex test and production systems, software control is of high relevance. Through commercial and customized software the systems are provided with the parameters needed for the application. All these work packages are of major importance for research and industry in order to be able to investigate the processes of the future in a robust and sustainable way.

System Development

The research topic focuses on developing new subsystems for production machines that incorporate advanced sensors and actuators to improve the manufacturing process. The objective is to reduce the number of rejected parts by monitoring and automatically correcting faults during production. This aims to leverage the latest advancements in machine learning and artificial intelligence to enable the production machines to learn from past mistakes and optimize their performance. The developed subsystems include state-of-the-art sensors for detecting defects and integrated actuators for real-time corrective actions. Extensive testing in relevant environment and evaluation to ensure the subsystems' effectiveness and technology readiness to reduce waste, increase productivity, and improve the overall quality of the manufacturing process. Ultimately, this research will contribute to the development of smarter and more efficient production systems that can adapt to changing production demands and minimize waste.



Fig. 1 Towpreg Machine at LCC

Test Bench Development

With the development of unique test rigs, it is possible to validate innovative theoretical concepts and models. By performing tests and measurements on these test stands, materials and technical components can be tested under controlled conditions. Furthermore, by using automation, tests can be performed more efficiently and economically. In addition, test results can be evaluated more reliably and objectively. In general, test stands are indispensable tools in research. They enable a controlled analysis of systems, materials, and components to be carried out.

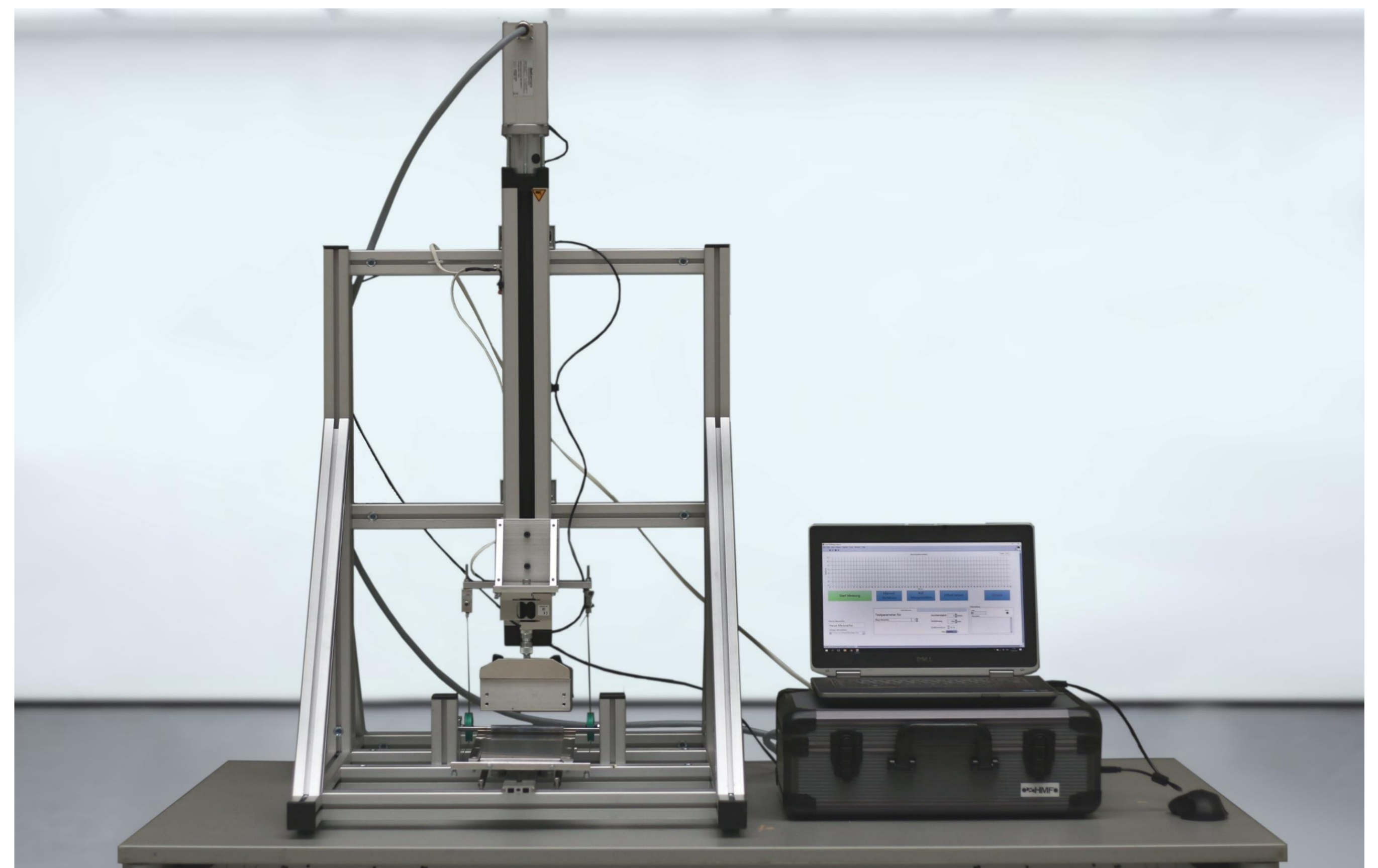


Fig. 2 TUM Peel Tack Test Bench – an exemplary development of the LCC

Automated Process Control

The automation of composite manufacturing processes is a key aspect of current research. Herein, the objective is to optimize the processes by making use of highly technologized tools and test benches in order to acquire data, which can then be used to analyze and optimize the process. The implementation of quality control measures is another important part for industrialization and certification of manufacturing processes. This can be achieved more easily with automated processes and constant monitoring of process parameters, as well as utilizing and developing advanced control systems and software.

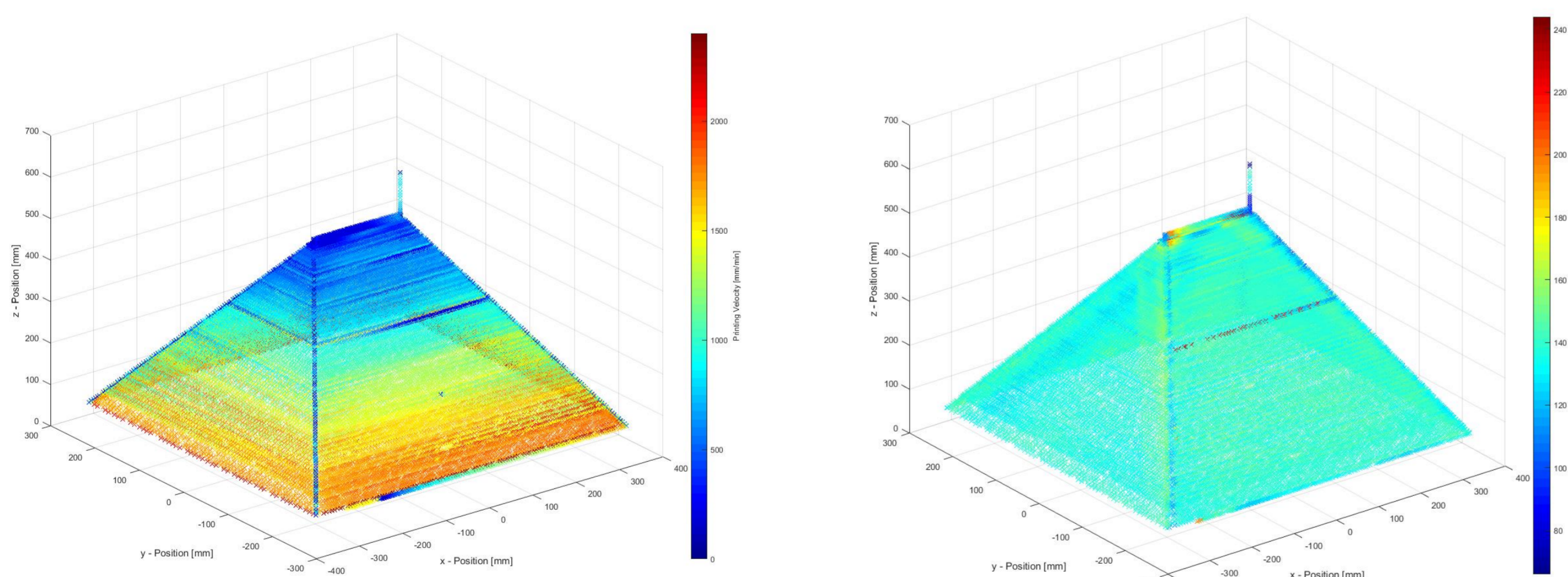


Fig. 3 3D-Printing velocity and temperature plot of a CAD geometry while using a new substrate heating technology

More information and contacts:

