ULTRASONIC WELDING

RESEARCH LOCATION

DLR Institute of Structures and Design, Augsburg

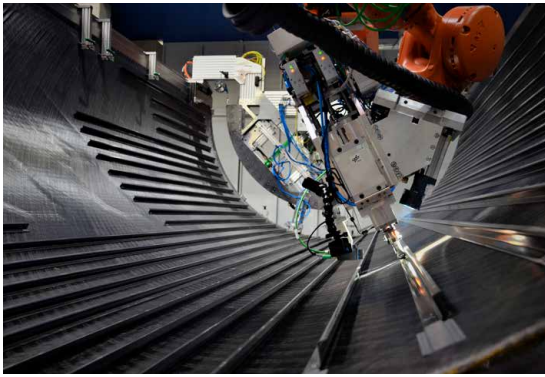
FUNCTIONAL PRINCIPLE

Ultrasonic welding is based on high-frequency vibrations (typically between 20 and 40 kHz) that cause surface friction and viscoelastic heating at the weld seam. The most important process parameters are the applied pressure as well as the welding time, frequency and amplitude. DLR Augsburg is a world leader in robot-based ultrasonic welding. Thanks to many years of experience, the process has already been used reliably in a wide variety of applications.

TEST SETUP

A robot end-effector was designed and realised at DLR Augsburg for the full-scale production of components. This allows the welding process to be applied to components of any size, limited only by the robot's reach.

The end effector is equipped with sensors to measure the process parameters, which are recorded at a sampling rate of 1 kHz. This data is used to train artificial neural networks and predict the strength of the weld immediately after the process.



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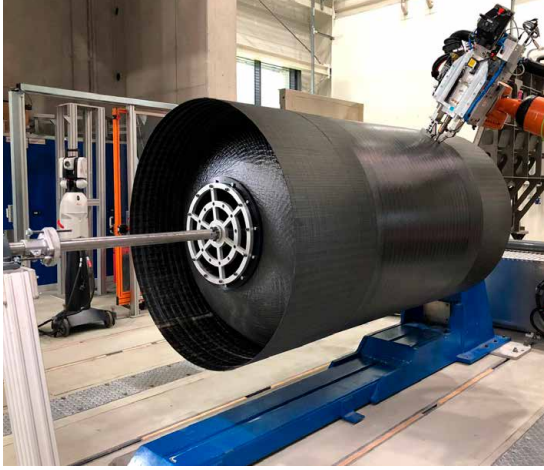

APPLICATIONS

The welding of thermoplastic fibre composite components offers the possibility of changing assembly sequences, e.g. in aircraft production. In the metallic aircraft fuselage, systems are currently integrated after the structure has been assembled, as these can be damaged by chips from the riveting process. However, this sequence has the disadvantage that limited accessibility makes assembly considerably more difficult.

In addition to the aerospace industry, ultrasonic welding of thermoplastic composite components can also be of interest to other sectors and applications e.g. in mechanical engineering, electrical engineering, the automotive industry, naval industry, medical technology and conveyor technology.

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YouTube video
Robot-based continuous ultrasonic welding