

AUTOMATED FIBER PLACEMENT FOR CLIMATE-NEUTRAL AEROSPACE

Broetje-Automation demonstrates automated production of hydrogen tanks made of CFRP

Innovative fiber placement technology makes an important contribution to the realization of the hydrogen economy. As part of a funded development project, Broetje-Automation, together with other partners, has successfully demonstrated the use of its AFP (Automated Fiber Placement) systems for the production of carbon fiber-reinforced hydrogen tanks. The tanks will be used for carbon neutral aerospace applications.

Many industries are currently working to implement hydrogen solutions to achieve the transition to sustainable systems. A particular challenge is the storage of this promising energy source. New processes and materials are being used and production systems need to be further developed. Tank production using AFP technology has been successfully demonstrated in the North German joint project "HyStor". The project was funded by the Innovation and Development Bank of Lower Saxony (NBank).

For the production of the tanks, Broetje-Automation used different models of its innovative STAXX product family for AFP systems: the STAXX One and the STAXX Flex.

Challenges of Automated Fiber Placement of Ultra-Thin Tows

The project investigated the feasibility of processing very thin tows with the STAXX One - a lightweight and flexible end effector that can be mounted on any standard industrial robot and can handle a wide range of materials including PrePreg, TowPreg and Dry Fiber. Due to the material properties of the prepreg tows and not least because of their low basis weight and low rigidity, high precision and stable process control of the AFP system are particularly important.

Broetje-Automation's STAXX One was able to meet these requirements with minor changes in design and operation, which improved the filing quality and speed. Among other things, the adhesion of the tow to the end effector was reduced with new coatings on the metal contact rollers and guides, and with a particularly powerful head cooling system that can cool the material in the head to well below ambient temperature.

Another challenge is the extremely thin tows on the cutting unit of the automated system. Here, the STAXX One demonstrated its usual high cut resistance, proving that even the most demanding materials can be reliably deposited with the STAXX One. This makes the system an ideal solution for material qualification and the production of components with new material requirements.

New product innovation – the mobile STAXX One AFP cell

The product idea that emerged from the project is a mobile STAXX One cell that is ideal for transportation and rapid deployment due to its dimensions of 4m x 2.4m. It can also be equipped with a

6-axis robot with optional rotary table or winding axis, making it ideal for the production of smaller but complex components. Such a system is already in operation at CTC-GmbH in Stade, Germany.

Industrial manufacturing capabilities for hydrogen tanks

The STAXX Flex was then used in collaboration with the DLR Institute of Lightweight Systems in Stade, Germany, to produce a tank storage segment in order to validate the scalability of the productivity of the storage with a multi-tow system.

The STAXX Flex is a powerful end effector for complex two- and three-dimensional parts. It can be mounted on robotic or gantry systems and can handle up to 16 tows simultaneously. This allows for even higher deposition rates.

The results demonstrate the high quality and extreme accuracy of Broetje-Automation's AFP systems, which make them ideal for the production of lightweight and robust hydrogen tanks made of CFRP.

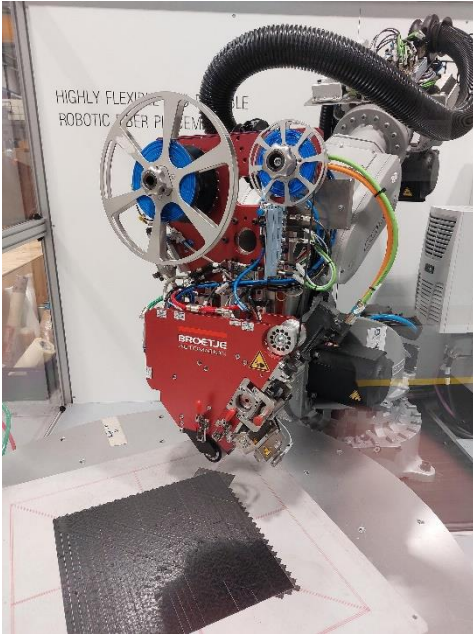
Contact

Norbert Steinkemper
Head of Communication and Marketing
Broetje-Automation GmbH
norbert.steinkemper@broetje-automation.de

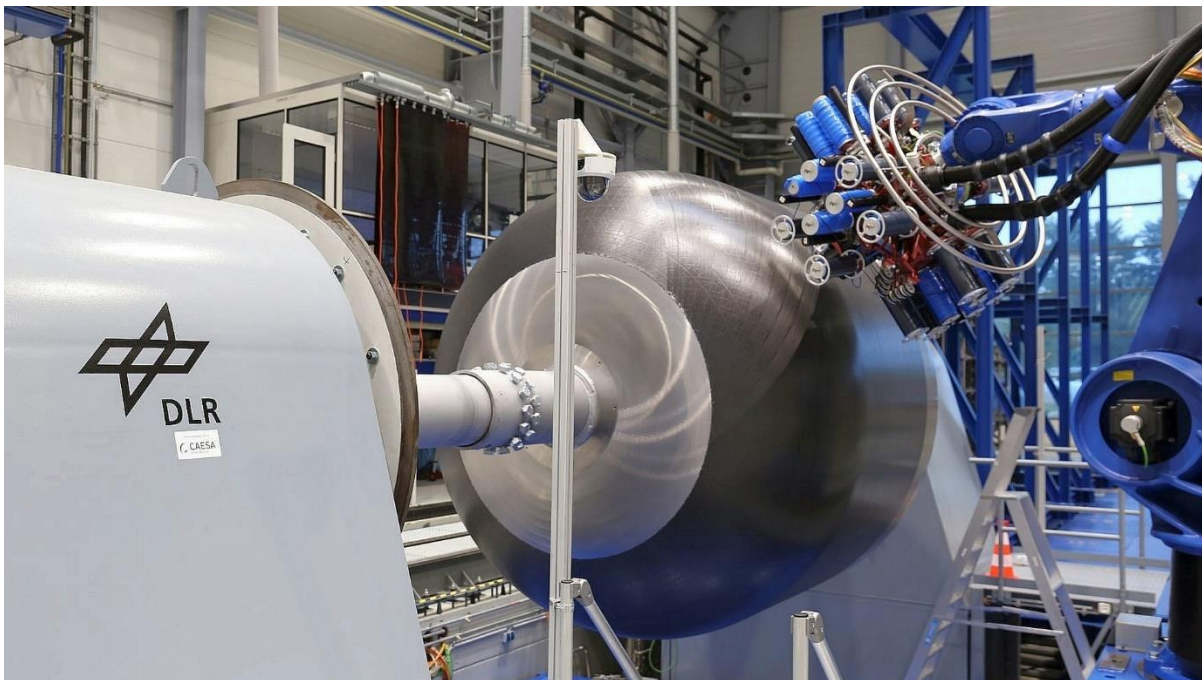
www.broetje-automation.de



Caption: A mobile STAXX One system is currently in operation at CTC GmbH in Stade



Caption: The STAXX family of AFP systems uses a modular principle for its end-effectors to enable tailor-made and highly flexible applications.



Caption: In the joint project with the DLR Institute of Lightweight Systems in Stade, the STAXX Flex 16-tow laying head was able to demonstrate its industrial performance.