Automated Production of Lightweight Components

The use of lightweight components such as fiber-reinforced plastics (FRP), and especially carbon fiber reinforced plastic parts (CFRP) is becoming more and more important in the automotive industry.

Lightweight components reduce energy demand through massive savings in weight and increase safety through better stiffness and damping of FRP products. In addition, the materials are resistant to corrosion.

Fiber-reinforced plastics include carbon fiber reinforced plastic parts (CFRP) include inter alia glass fiber reinforced plastics (GRP).

Research and development for seriesproduction

ASS works as a project partner with the Fraunhofer Institute for Production Technology (IPT) for the "Energy-efficient production of function-integrated thermoplastic fiber composite components" the so-called project "E-Profit".

The aim of the Federal Ministry of Education and Research (BMBF) supported by PTKA is to optimize manufacturing processes that enable suitable cycle times for mass production. The handling of flat, completely impregnated thermoplastic FRP semi-finished products, also called organo-sheets, is of great interest, particularly in automotive lightweight construction.

The research project will optimize the handling of organo-sheets (BVO-organic sheets). The organo-sheets are made from superimposed unidirectional, fiber-reinforced, thermoplastic tapes. The custom-made cold organic sheets are heated by a special robotic hand in an oven.

After heating the robot hand takes the heated organo-sheet and passes it to a mold. The warm and limp organo-sheet is reshaped according to the requirements and obtains its final form.

The simulated process shows that it is possible to produce an automation system for the automotive industry, which has a higher level of security and a weight advantage.

Challenges to the handling of non-rigid organic sheets

A particular challenge is the reliable handling of the organo-sheets. While the cold, untreated organic sheets and the fully formed and cooled parts can be treated conventionally, a more differentiated treatment is required for heated organic sheets.
During and after the heating of the material must be ensured that the limp composite sheet does not sag, that it maintains the defined position and that it is accurately positioned.

ASS has numerous tailored solutions for handling ultra-lightweight components made of thermoplastic carbon fiber-reinforced composite materials in the field. The original ASS Robot Hand Kit (EOAT) offers, for example, a variety of needle grippers to grip limp materials safely.

To ensure the best gripping solution usually also vacuum cups are used. For this purpose, we have specially designed vacuum cups that can withstand the temperatures and leave no or only minor marks on the material. For accurate positioning the kit includes for example, lockable centering units, centering pins, gripping fingers and jaws, stacking guides, and/or various sensors for queries.

Defined forming of organo-sheets without wrinkling

An innovative component for the defined and wrinkle-free forming of organo-sheet is the new stroke unit with linear potentiometer. This high-tech unit ensures the absolute accurate position of heated and limp organo-sheets.

This unit moves a defined force-way-voltage-profile, thereby maintaining the warm and limp organo-sheet at the required position. In addition, this unit allows better forming results by adjusting the unit during the thermoforming process. With a defined force-way-voltage-profile the heated organo-sheet is guided into the required positions. The figure below shows the new unit which can use up to seven pre-defined positions.

ASS and KNUR put their skills together - Automation and handling of lightweight components from a single source

ASS and KNUR offer component, gripper and automation system expertise for the plastic injection molding industry and the automated, lightweight automotive industry. KNUR Maschinenbau develops and supplies automation solutions for lightweight and plastic parts for the automotive industry. Focus is the field of fiber-reinforced plastics (FRP), particularly carbon-fiber reinforced plastic parts (CFRP).

An example is the theoretical model of FRP gripper as seen above: Fusion of the automated series production with the original ASS Robot Hand Kit as well as knowledge of the handling of tempered organo-sheets.
Press-Information

Image 1

Image 2

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