



## AUTOMATED CUTTING & STACKING ENABLES ECONOMICAL PRODUCTION IN THE AEROSPACE INDUSTRY

### HIGHLIGHTS

- » Dedicated cutting technologies for perfect cutting edges (polygon knife, round knife, ultrasonic knife)
- » Tool change in just a few steps thanks to quick exchange system
- » Flexible gripper system for processing of different materials and component sizes on same machinery
- » Software and control developed by Schmidt & Heinzmann for component-related storage of production data and resource efficient production planning
- » Customized control concept from Schmidt & Heinzmann

### BENEFITS:

- » Reduction of personnel costs up to 75% compared to semi-automatic production
- » Lower material costs due to significantly better material utilization
- » Optimized cycle time and significantly higher output thanks to parallel processes and integrated production planer

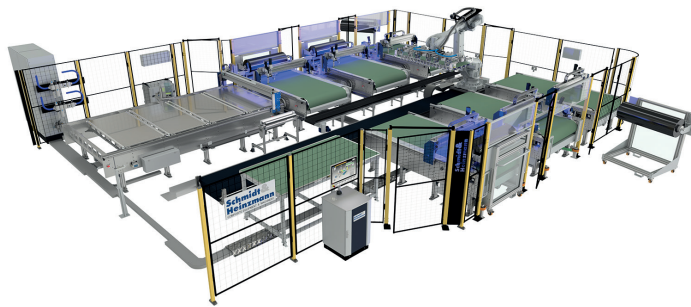
Despite geopolitical uncertainties and fragile supply chains, Airbus remains committed to further increase production of the A320 family.<sup>1</sup> The currently extremely high demand proves this strategy right.<sup>2</sup> In order to produce higher volumes economically and with the highest quality, the design and production process of spoilers for the A320 series were completely rethought.<sup>3</sup> The result was a switch to cutting-edge manufacturing processes as well as automation instead of manual production. Schmidt & Heinzmann supplied a cutting & stacking cell to Spirit Aerosystems, the company that produces the spoilers on behalf of Airbus.

The German Aerospace Center expects around 35 million flights worldwide and almost ten billion passengers in 2040.<sup>4</sup> These are growth rates of 49,3% and 135% compared to 2016. The corona pandemic only broke this trend for a short time and air traffic figures are recovering. German air traffic control has already counted more than 1.2 million aircraft movements for the first half of 2022 – 76% of the level in 2019.<sup>5</sup> These figures show that there will be an enormous demand for aircraft in the coming years. Therefore, their production must be made more efficient in terms of quantities and costs. Airbus has also recognized this and rethought the manufacturing process for spoilers with its long-standing supplier Spirit Aerosystems. Their site in Prestwick, Scotland, developed a new manufacturing process for spoilers and invested in new production equipment. Schmidt & Heinzmann supplied a fully automated cutting & stacking cell for this purpose.

Previously, the spoilers of the A320 were handmade and consisted of a sandwich structure – a honeycomb core with prepreg cover layers. In the future, the spoilers will be manufactured automatically using RTM (Resin Transfer Moulding) from epoxy resin and carbon and glass fibers. For this purpose, dry textiles are cut to size and stacked. Several stacks are consolidated into a preform. Afterwards this preform is infiltrated with resin.

The cutting & stacking cell supplied by Schmidt & Heinzmann consists of six cutting systems called “AutoCut” arranged in two rows. Four AutoCuts cut carbon fiber material, another AutoCut processes glass fiber material and the last AutoCut cuts consolidated stacks of several layers of material. A robot moves on a long linear axis between the cutting systems to remove the individual layers and assembles them on a metal plate (stacking plate) on a separate table. Each individual layer is checked by means of a camera. The layers are then locally consolidated to prevent individual layers from slipping during further transport. This fixation is achieved by a binder in the carbon fiber fabric, which is activated by heat. Afterwards the stack is then provided with a QR Code and the stacking plate is stored in a fully automated high rack until further processing.

Waste material produced during cutting of the individual layers automatically falls onto two conveyor belts placed at the end of the AutoCuts. These conveyors lead to a container where the waste material is collected. Of particular note is the fact that the system makes it possible to produce the cuts for several components at the same time. For example, Spirit Aerosystems produces nearly 20 stacks in parallel.



Overview: Six cutting systems model AutoCut and a central robot produce stacks in parallel. (Picture: Schmidt & Heinzmann)

## Optimized cycle time due to „one material one cutter” concept

There are two common methods of cutting textile fibers. In the first variant, all materials are cut one after the other on one cutter, which is served by its own material warehouse. The large textile rolls are taken from the warehouse, cut to size and then rolled up again. The winding and unwinding process can result in a slight misalignment of the material, which leads to inaccuracies when cutting. In order to obtain a straight material finish, a crosscut is set after completion of a material type, which causes a lot of waste. In the second method the stack is built before cutting. On a very long table, the individual rolls are unwound one above the other according to the later component. The part is then cut out from this layer structure. A single defect in single layer is multiplied by the number of layers – the scrap rate is therefore extreme.

Schmidt & Heinzmann takes a different approach with its “one material one cutter” concept. If a stack consists of several materials, a separate cutting system is planned for each material. This reduces

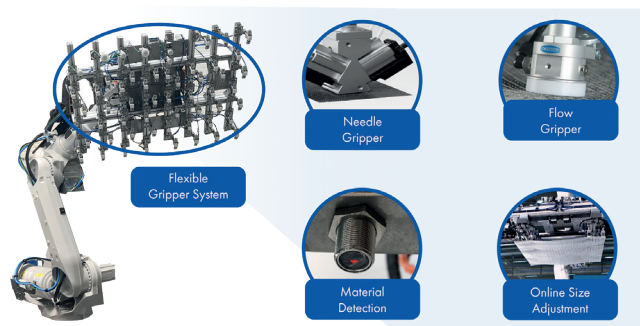
the cycle time, because setting up a new roll does not affect it – the other cutting systems keep continue working. This shortens the cycle time and increases process reliability, ensuring consistently good quality. In addition, the AutoCut impresses with further features such as semiautomatic feeding of textiles, intelligent unwinding as well as measurement of material consumption and textile position on the belt, which all benefit cycle-time-optimized and resource-efficient production.

In order to obtain clean cutting edges, the cutting technology that perfectly matches the material (polygon knife, circular knife or ultrasonic knife) is selected. A quick exchange system enables the cutting tool to be changed in just a few simple steps. This reduces setup time to a minimum and increases system availability both when changing to a different cutting technology and when replacing a wornout knife. In this case, the entire cutter head is simply replaced. The knife itself is then replaced outside the line while the line continues to run.

## Cost-efficient component handling thanks to flexible gripper systems

The stacking robot, which removes the individual layers from the AutoCut and assembles them into a stack on the stacking table, has a large number of individual grippers. In order to handle different cut sizes with just one gripper system, the grippers can be controlled individually (matrix gripper). This offers maximum flexibility and cost efficiency. “Spirit Aerosystems uses air flow grippers”, explains Michael Ochs, Vice President and Director of Sales at Schmidt & Heinzmann. “In general, needle or vacuum grippers can also be used, depending on the material. Upon customer’s request, we install several gripper variants in one gripper system. This offers even more flexibility and application possibilities.” In addition, the gripper system can realize different fiber orientations by selectively rotating the individual layers before placement. Removal from the cutting system and placement on the stacking table is monitored by sensors. On customer’s request, the cutouts can also be scanned using a line scan camera.

The image is then linked to the other process data via the QR code on the component and can be used for automated quality monitoring.



Flexible gripper system enables handling of different components (Picture: Schmidt & Heinzmann)

## Increased safety through traceability

For seamless traceability, the stacks on the stacking plate are provided with a QR code. It contains all the information relating to the component, such as the type of component, date of manufacture,

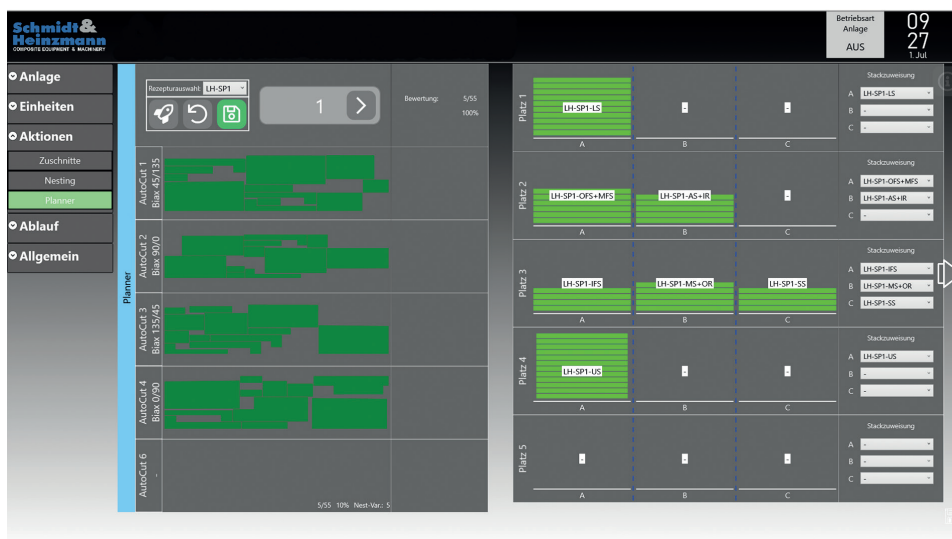
semi-finished product batch and linear meters, process parameters as well as sensor and quality data. This enables traceability of each individual layer of the component.

# Customized control and interacting components ensure resource- and cycle-time-ideal production

Normally providers of cutting & stacking solutions act as integrators. This means they buy the individual components from different suppliers and assemble the production cell from these individual parts. In this case, each component has its own control, which is coordinated by a higher-level control system. The closed systems of the individual manufacturers usually only allow a limited exchange of data with the higher-level control, which significantly reduces the efficiency of the system.

Schmidt & Heinzmann's system is different, because the control system, cutter and gripper were developed in-house. As a result, all components can interact directly with each other, which enables production that is ideal in terms of resources and cycle times. In addition, all measured values, states and other data of all sensors and actuators are available at any time. Therefore, all quality-determining parameters of the manufacturing process can be determined and stored in relation to the component.

A planning software, also developed by Schmidt & Heinzmann, determines the nesting for the individual cuts. This optimized cutting plan allows the efficient utilization of the material, which significantly reduces the material waste. Nesting even succeeds across all AutoCuts and products when using multiple cutters and creating several stacks simultaneously. This is particularly relevant, for example, if defects are detected in the material of one cutter. The software then calculates a new optimized cutting plan for hundreds of cuts on all six AutoCuts, taking into account the areas to be left out. In addition, the robot receives the adapted information which is necessary to pick up the cuts, such as number of cutting system, position and orientation on the belt, as well as the new gripper assignment. The optimization of the cutting plan is continuous, automated and without pausing production. This enables the realization of complex components while minimizing the use of raw materials. In addition, the software guides the machine operator step by step through all setup and parameterization process.



Nesting software for optimal utilization of the material

(Picture: Schmidt & Heinzmann)

## Summary:

### Automation for sustainable production

With the change from manual to automated production, Spirit Aerosystems will focus on reproducibility, precision and high quality in the process. "With components made of different materials, fiber orientations and several hundred individual layers, manual production is almost impossible. Especially when, as in this project, safety-relevant components are involved. Automation of the production process is then essential.", knows Michael Ochs.

Automating the "cutting & stacking" process step can save up to 75% personnel costs compared to semi-automated production, depending on the component. In addition, the ideal utilization of the material and the optimization of the cycle time contribute to the conservation of resources – for a sustainable production.

<sup>1</sup> <https://www.handelsblatt.com/unternehmen/industrie/flugzeughersteller-nach-milliardengewinn-airbus-will-produktion-der-a320-familie-auf-rekordniveau-erhoehen/28306324.html> [12.09.2022]

<sup>2</sup> <https://www.flugrevue.de/zivil/mehr-nachfrage-als-angebot-airbus-gehen-die-flugzeuge-aus/> [12.09.2022]

<sup>3</sup> <https://www.compositesworld.com/articles/high-rate-automated-aerospace-rtm-line-delivers-next-gen-spoilers> [19.08.2022]

<sup>4</sup> [https://www.dlr.de/content/dea/artikel/news/2019/04/20191216\\_fast-zehn-milliarden-flugpassagiere-im-jahr-2040.html](https://www.dlr.de/content/dea/artikel/news/2019/04/20191216_fast-zehn-milliarden-flugpassagiere-im-jahr-2040.html) [19.08.2022]

<sup>5</sup> <https://www.dfs.de/homepage/de/medien/presse/2022/20-07-2022-dfs-verzeichnet-bis-zu-20-prozent-mehr-verkehr/> [19.08.2022]

## SMC TECHNOLOGIES

World-class SMC production equipment for manufacturing of glass and carbon fiber SMC material and parts.

## CUTTING & STACKING

High volume manufacturing line for efficient and economic fiber cutting and stacking production.

## PREFORMING FOR RTM

Innovative production cell for dry fiber fabric preforming.

## AUTOMATION

Automation of processes for FRP product manufacturing.

## DEBURRING

Resource efficient automated deburring of FRP components.

## FIBER PROCESSING

Proven solutions for fiber cutting and fiber spraying.

## FOLLOW US ON



# Schmidt & Heinzmann

COMPOSITE EQUIPMENT & MACHINERY

**Schmidt & Heinzmann  
GmbH & Co. KG**

Vichystraße 12  
76646 Bruchsal  
Germany

[info@schmidt-heinzmann.de](mailto:info@schmidt-heinzmann.de)  
[www.schmidt-heinzmann.de](http://www.schmidt-heinzmann.de)

**Schmidt & Heinzmann  
North America Inc.**

Chandler Tech Center  
7404 W. Detroit Street, Suite 170  
Chandler, Arizona 85226  
US

[c.fais@schmidt-heinzmann.com](mailto:c.fais@schmidt-heinzmann.com)  
[www.schmidt-heinzmann.com](http://www.schmidt-heinzmann.com)

**Schmidt & Heinzmann  
Shanghai Co. Ltd**

No 1111  
Xinsongjiang Road, Songjiang District  
Shanghai 201620  
China

[info@schmidt-heinzmann.de](mailto:info@schmidt-heinzmann.de)  
[www.schmidt-heinzmann.cn](http://www.schmidt-heinzmann.cn)