Schmidt & Heinzmann
COMPOSITE EQUIPMENT & MACHINERY

Be always one step ahead.

SMC PRESS AUTOMATION ENSURES PROCESS STABILITY

HIGHLIGHTS

- Dedicated cutting technology with round knife
- Generic AutoCut software for easiest programming allowing fast and material-saving operations
- Advanced AutoCut system with weight compensation function for ideal molding results
- Specific gripper design and manufacturing by Schmidt & Heinzmann
- Fastest prodcut change over without need for reprogramming
- Fastest cycle times and highest production outputs due to shortest mold opening times

BENEFITS:

- Reduction of 6 operators in 3-shift production
- ROI < 1.7 years
- High cell availability with lowest scrap rate

"Schmidt & Heinzmann has been a reliable and valued supplier of ours for years. One again, Schmidt & Heinzmann delivered an innovative and robust production cell."

When processing SMC material in the premium segment of passenger cars, OEMs are continuously increasing their quality standards, especially when process stability, high surface quality, tight tolerances of weight, shape and position as well as economical production are the focus. A leading European molding company and Tier-1 supplier has, together with Schmidt & Heinzmann, overcome these challenges by using press automation.

SMC semi-finished material (Sheet Molding Compounds), made from thermoset resin and glass fibers, has proven itself for years for the production of fiber-plastic composites. In industries such as the automotive and commercial vehicle, as well as rail road, electronics or construction, the material has estabished itself due to its high durability, low weight, good shape and high surface quality. This material is particularly popular for the production of hoods, roofs, coverings and trunk lids of passenger cars. To keep the product specifications and to remain economical at the same time, it makes sense to automate the manufacturing processes.

A Tier-1 supplier made this decision. The developer and manufacturer of high-quality composite parts optimizes his production with a new press automation. The system consists of a cutting unit, scales, several cooling units, which are adapted to the products, and an outlet conveyor belt. The handling within the production cell will be done by two industrial robots. The system is one of the first press automations at this location. This process step has largely been carried out manually up till now. With the new press automation components, trunk lids, amongst others, will be produced as an OEM in the premium segment in the future.

High product quality starting with the first process step

The SMC material is delivered, in jumbo rolls, to the press companies, and is protected against drying out by films on both sides. The films will be removed and unwound before cutting, and the flat molding material will be fed into the cutting unit.

"In this case the customer decided to use the cutting unit 'AutoCut'," explains Martin Stehle, Project Manager from Schmidt & Heinzmann. "This 2D free-form cutting unit is specifically designed for usage in automated production cells and for geometrically challenging cuts of SMC or other mat-type semi-finished materials or textile fiber reinforcements."

The knife can cut rectangles or other geometries on the material, depending on the component geometry and requirements. The dependable cutting of impregnated fiber mats is decisive.

The guarantee of flawless, continuous cuts as well as reliable detection and recessing of the material edge areas has already in the beginning of the manufacturing process an important impact on the finished part, because faults cannot be corrected afterwards. To attain precise cutting edges, Schmidt & Heinzmann chooses the right cutting technology among polygon knife, round knife or ultrasonic knife which perfectly fits to the material. In this case the second option delivered the optimal cutting results at highest economic efficiency.

Automated weight control and compensation avoid weight variations

Another challenge is the consistent weight of the cut. Depending on the component, numerous cuts are layered, as mats, on top of one another during the processing of the SMC material. Larger and smaller cuts will be laid based on a defined laying pattern. In addition to the geometry, an exact weight of the mats is also important for the production of components with constant quality.

Any weight variations of the material have to be compensated during the cutting process. Each cut is automatically weighed in the process, to detect possible weight variation immediately. Using a weighing algorithm, the AutoCut control automatically adjusts the cuts in their cut size so that the individual differences are compensated and the total weight of the stack is always within the tolerance range.

Automated weighing of the cuts and automated correction of the following cuts, if necessary, ensures to keep the total weight of the stack.
(Photo Schmidt & Heinzmann)

Reproducibility of the process

After cutting and weighing the cuts are pressed. "In the past we have manually inserted the cuts into the press. The demand on precision and reproducibility is so high, that this can no longer be achieved manually. The exact reproducibility process is crucial for the quality of the press results, and thus the stability and error-freeness of subsequent production processes," explains the Head of Purchasing of the molding company. "In consultation with our colleagues from the production, we have therefore decided to automate the entire SMC process."

Now a robot is used, which reliably and quickly picks up the individual cuts from the AutoCut and stacks them with its stacking gripper according to the laying pattern. Afterwards another robot, in this case the handling robot, picks up the entire package and places it in a single operation reproducibly into the mold. The kinematic functions (tilting and pressing) which are integrated in the gripper ensure correct positioning even with complicated laying patterns.

A robot with stacking gripper reliably and quickly stacks the cuts to their place.
(Photo Schmidt & Heinzmann)

Subsequently the SMC cuts are formed and cured into the final component using a hydraulic press under the pressure and temperature which is required for the component. Due to the good flowability of the material, complex geometries, jumps in wall thickness, ribs and the integration of metallic inserts are also possible. After around 2 minutes the pressing process including the hardening of the material is completed. Then the handling robot takes the component again out of the press and places it for cooling down onto the cooling station to prevent warping.

After reaching the desired temperature, it is transported out of the production cell by the outlet conveyor. The intelligent and flexible combination gripper used for this operation is developed to handle each component exactly and can be used for the loading of the press with semi-finished material, as well as for unloading the molded component as well as for cleaning of the mold.

This shortens the cycle time and can also be used to securely realize cuts and components for large tools or special geometries.

From the composite processor's point of view, a key aspect for a high quality result is the flexibility and usability of the production cell. "Thanks to the individually adjustable AutoCut and the grippers as well as the controllable force of the mold press the production cell can be used flexibly for a wide range of component geometries, material thicknesses and laying patterns. A further advantage is, that all the parts and functions of the production cell are managed in one machine control system. This simplifies operation and makes the system very interesting for us from a cost perspective," he adds. The ability to import CAD cutting patterns ensures during a product change an easy and error-free generation of a new recipe, without the neat for the operator to reprogram the AutoCut and the stacking robot.

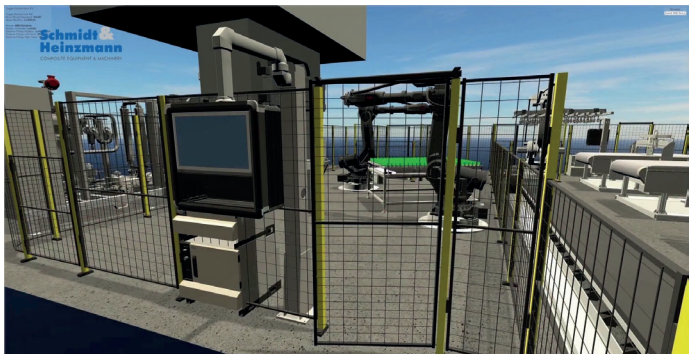
Intelligent space saving – thanks to optimal planning using virtual reality

"One of the biggest challenges of the entire project was certainly the limited space available at the customer. Here we had to make adaptions to the concept originally envisioned by the customer in order to find an optimal solution," noted Martin Stehle. The radius of action of the robots was very limited due to structural conditions on site. The available space was used optimally by a sensible layout of the components of the production cell and a logical programming of the robots.

Due to the limited space, a specific solution was also developed for the component cooling station with integrated storage area for handling gripper. Thanks to the automatic changing head, the robot automatically places the gripper on the cooling station when a recipe is changed and picks up the new gripper again independently after the cooling station has been replaced.

Especially when space is limited and when integrating into existing production environments, it is often very useful to plan the production cell via virtual reality. For this purpose, a 3D scan of the customer's building is created and transferred into a virtual model. This exact image can now be used to plan and simulate the complete production cell of the customer.

As a result, any disruptive factors of a spatial or logistical nature are recognized in good time, which increases planning security and lowers the duration and the costs of machine commissioning. Whether short-time changes to the layout or technology of the production cell can also be implemented on the customer's production area, can also be quickly checked. This ensures maximum flexibility.



Especially when space is limited and when integrating into existing production environments, it is often very useful to plan the production cell via virtual reality.
(Photo Schmidt & Heinzmann)

Summary:

High component quality and low defect rate

"We have ensured process stability and a high surface quality with the automated production cell", sums up the customer. "Due to precise and continuous processing of the SMC material, there are no problems with air pockets or dry material. A very high quality surface is therefore achieved in the subsequent coating.

The tolerances for weight and shape can also be controlled very well." Finally, he answers the question of whether the investment in the automation pays off: "The high stability of the process provides safety and reduces risk for the OEM. We achieve a very low defect rate and avoid potential machine breakdown and downtime. This means that our internal processes are also stable. Together with short set-up time and a high degree of flexibility for different components, the investment will therefore pay for itself within a very short period of time. We determined an ROI of less than 1.7 years."

SMC TECHNOLOGIES

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Schmidt & Heinzmann

COMPOSITE EQUIPMENT & MACHINERY

Schmidt & Heinzmann GmbH & Co. KG

Vichystraße 12
76646 Bruchsal
Germany

T +49 7251 38 58-0
info@schmidt-heinzmann.de
www.schmidt-heinzmann.de

Schmidt & Heinzmann North America Inc.

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

P+1 602 585 0880
c.fais@schmidt-heinzmann.de
www.schmidt-heinzmann.com

Schmidt & Heinzmann Shanghai Co. Ltd

No 1111
Xinsongjiang Road, Songjiang District
Shanghai 201620
China

P +86 182 0214 6469
y.liu@schmidt-heinzmann.de
www.schmidt-heinzmann.cn