Be always one step ahead

SMC PRESS AUTOMATION PRODUCES PROCESS STABILITY

When processing SMC material in the automobile high-end premium segment, the OEMs are continuously increasing their quality demands. The most important aspects are process stability, a high surface quality, narrow tolerances for weight and shape, and economical production. The report shows how one supplier has met the challenges with SMC press automation.

SMC semi-finished products of thermoset reactive resins and glass fibers, the Sheet Molding Compounds (SMC), have proven themselves for years in the production of fiber-plastic composites. In industries such as automobile and commercial vehicle manufacture, railway, electronics or the building industry, the material has established itself due to its durability, low weight, good forming properties and the high surface quality. For automobiles, this includes, for example, parts such as bonnets, roofs, panels and trunk lids. In this report, a composite processor provides an insight into the automated processing of the SMC material.

Schmidt & Heinzmann
COMPOSITE EQUIPMENT & MACHINERY

SMC PRESS AUTOMATION PRODUCES PROCESS STABILITY

Weight variations in SMC material

"We are using an innovative machine from Schmidt & Heinzmann for SMC press automation for processing SMC material in the automobile high-end premium segment. With this we achieve a reproducible process stability and a high part quality", reports the responsible project manager for the composite processor.
The SMC material is supplied to the processor on rolls protected against drying out on both sides by a film.

The films are removed before cutting and rolled up and the molding material fed to a cutting module. Here the CNC cutter separates rectangles or trapezoids from the material, depending on the part geometry and requirements. In this process, reliable cutting of the SMC fiber matting containing resin is not trivial. No fibers may be pulled out or broken off when cutting. If a lot of fiber residues remain stuck to the knife, defects or machine breakdowns can occur.

The SMC cutting machine "AutoCut" is used as the CNC cutter. The 2D cutting system from Schmidt & Heinzmann has been designed especially for use in automated production cells and for geometrically demanding cutting of SMC and other mat-type semi-finished materials.

Figure of process
Fibers may be pulled out or broken Without pulling or breaking out any fibers, the CNC cutter separates rectangles or trapezoids from the material, depending on the part geometry and requirements. .

(Photo Schmidt & Heinzmann)

A further challenge is the constant weight of the cut material. Depending on the part, numerous pieces of cut material are laid over each other in layers as mats during processing. In this way, large and small cut pieces can be combined to give a specified shape.
"In order to produce parts with constant high quality, alongside the geometry, the exact surface weight of the mats is particularly important. Any deviations in weight in the cut material must be evened out" according to the project manager.

"The cut material is automatically weighed during the running process in order to detect any weight deviations immediately. The control system for the CNC cutter then adapts the following cut material using a weight algorithm such that the total weight of the cut materials varies by less than 3% from the target values. In this way, the machine control system for the CNC cutter can also manage complicated cut materials."

Reproducibility of the process

After cutting and weighing, the cut materials are pressed. "In the past, we laid the mats manually into the press. The cycle time lasts around four minutes and the workers have sufficient time for this. In the meantime, the demands on precision and repeatability have become so high, however, that this is no longer feasible manually" the project manager adds.

The exact reproducibility is, however, decisive for the quality of the press results and thus for the stability and freedom from defects of the subsequent production processes. Therefore, the composite processor has automated the complete SMC processing process. Now a six-axis robot is used that, with its packaging gripper, reliably lays the individual mats in their position.

Afterwards, the feed robot takes the layout produced by the packaging gripper and reproducibly lays the cut materials in the mold. The tilting and pressing functions integrated in the gripper ensure correct positioning even for complicated shapes

The stacking and weighing process
The composite processor has automated the complete SMC processing process with CNC cutter, six-axis robots and hydraulic press.

(Photo Schmidt & Heinzmann)

The SMC glass-fiber mats are then formed and cured into the target part in a hydraulic mold press for around three minutes under the pressure necessary for the part at a temperature of approx. 150 degrees. "With the new cooling concept, the parts now cool during the press cycle time to room temperature", is how the project manager describes the changed process step.
After cooling, the robot removes the part for further processing. The combination gripper used for this was specially designed for this part. Large shapes or particular geometries can be securely removed in this way.

"An important aspect for high-quality results from the perspective of the composite processor is also the flexibility and operability of the machine: The machine can be very flexibly deployed for the widest variety of part geometries, material thicknesses and cut shapes due to the individually adjustable CNC cutter and the grippers, as well as the controllable force of the mold press. A particular advantage is that all machine areas and all functions are operated with a uniform machine control system. This simplifies operation."

Introduction of the SMC press automation

At Schmidt & Heinzmann, the manufacturer of the SMC press automation system, the machine, planned according to the customer's specifications, was initially installed completely in their factory and commissioned. In this process, all part functions were checked and the component interaction tested. "We carried out a preliminary acceptance of the new machine at the manufacturer. Despite that, the installation and commissioning in our factory was associated with a number of challenges" according to the project manager. This included the correct placement of machine components such as heating units and control cabinets to programming and setup of cutter, robot, gripper and press functions. At the conclusion of the commissioning, training of the operating personnel took place.
"The setup and setting of the machine until beginning a reliable series production took about six weeks. In the process, aspects such as constant traceability of the parts produced also had to be ensured", is how the project manager summarizes the commissioning. To do so, all process steps are documented and every part is given a data-matrix label for traceability.

After commissioning, the composite processor also ensured the support of the manufacturer. A service contract governs the scope of the support, from the hotline to reliable remote maintenance access using VPN. Many machine breakdowns such as incorrect programming or misaligned sensors can be dealt with remotely in this way.
A further area is questions around machine optimization. The composite processor would like to utilize the possibilities of the CNC cutter more intensively and reduce scrap when cutting SMC material.

Conclusion: High surface quality and a low defect rate

"Due to the exact and continuous processing of the SMC press molding material, there are no problems with air pockets or disrupting dry material. In the subsequent painting, a very high-quality surface is therefore achieved." He confirms that tolerance values for weight and shape are also very well adhered to.

"With the machine automation, we have secured the process stability and a high surface quality", concludes the project manager."

Finally, he answers the question of whether the investment in the automation was worthwhile: "The high process stability of the process gives security for the OEM. We achieve a low defect rate and prevent machine downtime. As a result, our internal processes are also stable. Together with short setup times and high flexibility for different parts, the investment will therefore amortize very quickly."

Schmidt & Heinzmann

COMPOSITE EQUIPMENT & MACHINERY

SCHMIDT & HEINZMANN
GmbH & Co. KG

Vichystrasse 12
D-76646 Bruchsal
T +49 7251 38 58-20
F +49 7251 38 58-25
info@schmidt-heinzmann.de
www.schmidt-heinzmann.de

WEB

DOWNLOADS

YOUTUBE