



FULLY AUTOMATED SMC LINE SETS NEW STANDARD IN SMC MATERIAL PRODUCTION

HIGHLIGHTS

- » Sensoric and closed loop control for quality-determining process variables such as surface weight of the resin, fiber content, de-aeration, pressure and depth of impregnation
- » Automated transfer of all material and process parameters when changing recipes
- » New, self-adjusting high precision doctor box system with optimized cleaning capability
- » Roving cutter especially developed for processing of carbon fibers
- » Temperature control of doctor boxes, impregnation unit and finished material for active control of material viscosity for perfect impregnation results
- » Material buffer for continuous production of SMC even when changing the material boxes
- » Automated ejection of full material boxes and feeding of empty boxes – can be integrated in fully automated logistics

BENEFITS:

- » Cost reduction due to lower scrap rate for production of SMC material as well as the molded part
- » Structural CF-SMC which sets the benchmark in the market in terms of mechanical properties
- » Maximum reproducibility of processes and quality thanks to employee independence
- » Can be perfectly integrated into modern fully automated production concepts

Driven by the topic of lightweight design more and more companies from different industries have to master the balance between the usage of high quality materials while reducing costs at the same time. Schmidt & Heinzmann designed the first fully automated SMC line for production of semi-finished material for a Tier-1 supplier from the automotive industry. With the integrated closed loop control the customer relies in the future on an improved quality of the manufactured SMC material and thus on employee-independent reproducibility and cost efficiency at the same time.

“With our new SMC production line, we are increasing the production of particularly high quality carbon fiber SMC and making manufacturing more productive step by step.”

Sheet Molding Compounds (SMC) are shapable molding materials made from duroplastic reaction resins and fibers, for example made of glass or carbon. The material is used for the production of components, which are exposed to very high mechanical load and should be as light as possible at the same time. Typical applications for the lightweight components are automotive industry, sports and leisure industry in the field of sanitary or in the aerospace industry. The complex manufacturing process as well as the carbon fibers themselves, make carbon fiber SMC a relatively expensive material. Nevertheless, due to its special properties, the material is attractive for selected applications.

The customer, a global Tier-1 supplier for automotive parts in the premium segment has been valued by many well-known OEMs for decades. The company is one of the world's leading manufacturers of carbon fibers and also produces carbon fiber SMC semi-finished material. Due to the placement of the SMC line in Southern Europe, the European market is efficiently served. The main focus is on the production of very high quality SMC semi-finished material to marketable prices. The SMC line consists of a 3 component pumping, dosing and mixing unit and a SMC production line model HighLine 1600, which is composed of two automated doctor boxes, a wide roving cutter for carbon fibers as well as a de-aeration system and an impregnation unit.

The finished SMC material is placed in boxes using the zig-zac method. If the box is full, the SMC material is automatically cut of. The material box is ejected and replaced by an empty box. In the meantime, a material buffer ensures continuous SMC material production without machine stop.



The material buffer allows continuous production without machine stop during automated ejection of full material boxes.

(Photo Schmidt & Heinzmann)

Permanently constant quality thanks to closed loop control

Even small variations of the composition or inconsistent production conditions change the properties of the composite material. Therefore a stable production process is decisive for quality. This is where the fully automated production line from Schmidt & Heinzmann comes in. "If employees in production are forced to adjust machine settings manually, it depends on the discipline of the respective employee how precisely the corresponding setting is made or whether the necessary adjustments are made at all," notes the Head of Production of the composite manufacturer. This leads to varying quality of the SMC semi-finished material, which may result in increased scrap in later production steps.

Thanks to the fully automation the machine works independently. All control parameters such as temperature, speed, doctor box gap, as well as the pressure and the gap of the impregnation unit will be automatically adjusted and continuously monitored by sensors. All recipes with the corresponding machine settings are stored in the control system. They will be adopted accordingly when changing to another recipe. This ensures constant product quality and reproducibility. "Some segments of our SMC lines, for example doctor box and carrier film unwinder have been controlled automatically for years. Other automations have been added. In this way we achieve a closed loop control, which ensures a constantly good production process," explains Michael Ochs, Vice President and Director of Sales at Schmidt & Heinzmann.

Automated impregnation unit for a perfect result

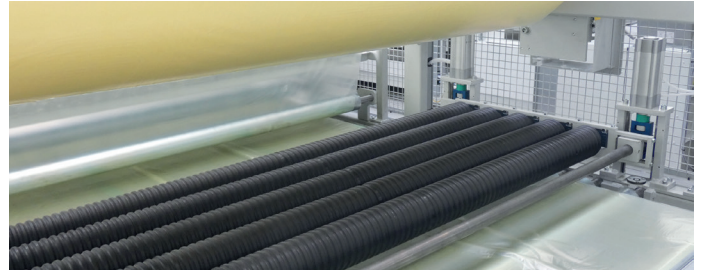
Even if the mixture from resin and carbon fibers seems to be perfect on a macroscopic level, product properties can vary. The problem only shows up at the microscopic level. For outstanding product properties the fibers must be completely wetted with resin. This process step, known as impregnation, therefore has a particularly high importance in the production process.

In order to achieve a perfect degree of impregnation, the gap between the impregnation rolls must correspond exactly to the previously defined value. If the gap is too large, the fibers are not

completely wetted with resin, if the gap is too small, the carrier films are pressed together with too much pressure and the resin is pressed out of the carrier films on the left and right side. With the automated impregnation unit, the distances between the impregnation rolls are set fully automatically and with high precision to match the recipe. The same applies to the pressure of the six large pneumatic cylinders which is also continuously readjusted and logged. This guarantees a perfect impregnation of the fibers throughout the entire production cycle and thus significantly reduces scrap.

Automated de-aeration unit securing a cost-efficient production of the molded component

The process step „de-aeration“ is also automatically controlled for the first time. The effective lengths of the de-aeration unit can be changed by a motor. The machine control constantly adjusts it to the current speed of the line, so that constant de-aeration can always be guaranteed – even at maximum speed of the line. Air pockets in the SMC material lead to hollow spaces in the component during the press process, in which a molded component is created from the SMC material. At this time a lot of resources were already invested, such as production and ripening time of the semi-finished material, cutting and stacking of the single layers and pressing of the laying pattern into the prefabricated component. Due to the air pocket, the component loses its stability and can not longer be used by the OEM. Avoiding air pockets at an early step of the production process thus has major impact on the cost structure and thus ensures a cost-efficient production.



A constant de-aeration due to adaption to the current speed of the line guarantees the avoidance of air pockets.

(Photo Schmidt & Heinzmann)

Sheet weight area control system for an automated adjustment of all production parameters

As well as the mentioned incomplete impregnation of the fibers, differences in sheet weight within the semi-finished material are also problematic. These can occur if the resin is not applied evenly or the distribution of the fibers is not homogeneous. Then the desired material properties are not longer given. In order to guarantee an even sheet weight, Schmidt & Heinzmann relies on the use of a sheet weight area control system. This measures the sheet weight at up to three positions during the production process. If this is not optimal, the production parameters such as the gap of the doctor box are automatically adjusted. “This enabled the customer to significantly reduce the scrap,” explains Michael Ochs



The sheet weight area control system continuously ensures a high quality of the SMC material and thus the adherence of the desired material properties.

(Photo Schmidt & Heinzmann)

Summary:

High quality SMC – permanent and independent of employees

“With our new SMC production line, we are extending the boundaries in terms of material quality by means of closed loop control for all quality-determining process variables. This enables us to increase the output and to achieve a particularly high performance carbon fiber SMC and makes the production more efficient step by step.” sums up the Head of Production of the composite manufacturer. “Thanks to the closed loop control, we can do this independently of employees and we are able to avoid varying quality. We guarantee a continuously high quality of the semi-finished material to our customers.”

It is clearly noticeable, that this function is in high demand in the market. “We have already received inquiries from customers who would like to retrofit full automation on their existing production lines. From an economic point of view this doesn’t make sense. When purchasing a new SMC line the extra price is definitely worth it,” adds Michael Ochs.

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.

FIBER PROCESSING

Proven solutions for fiber cutting and fiber spraying.

BONDING

Unit for precise bonding of multiple FRP and metal components.

FOLLOW US ON



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