USER REPORT
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Photos: BMW

Fig. 1: The rear doors of four-door passenger car models are designed maximum wide, reaching over the rear wheel, for maximum entry comfort. That limits the available movement space for the crank window in the door body. Therefore, the door glazing consists of a movable and a fixed glass.

LWB-Steinl-injection molding technology at Henniges Automotive / Rehburg-Lower Saxony

Assembly of higher integrated car window modules through injection molding

The integration of individual parts to a multifunctional assembly is one of the important innovation potentials of plastic injection molding, eg. the production of glass window modules for car rear doors, as practiced at Henniges Automotive in Rehburg, Lower Saxony. They consist of the glass pane, a web strip, and fastening clips, which are overmolded by a TPE frame to a ready-to-install assembly. For that specific injection molding task Henniges Automotive relies on vertical C-frame injection molding machines from LWB-Steinl.

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The rear doors of four-door passenger car models are designed maximum wide for maximum entry comfort. Therefore, they extend, depending on the car model, more or less far beyond the rear wheel. This results in a downwards tapering of the door body, leaving not enough room for the vertical movement of a crank window in full door width. The problem resolution to this is the division of the window area into a movable and a fixed part. (Fig.1) At the split line between the movable and the fixed glass pane, a web bar provides the crank guide on one side and the fixed glass enclosure on the other side. The web bar, including integrated threaded bushes, as well as further fastening clips are combined with the glass pane to a ready-to-install assembly module by overmolding with TPE. In addition the TPE-area functions as an elastic fitting to the door frame (Fig. 2).

Assembling on a horizontal or a vertical machine?

First off: At Henniges Automotive, both horizontal and vertical injection molding systems are used for the "injection molding assembly" of window glass modules. Henniges Application Technology Manager Norbert Aumann explains the decision criteria which injection molding system is preferred: "We produce window modules for a number of different vehicle models, especially for rear doors and the directly adjacent window surfaces. The difference lies above all in the type and the number of assembly parts to be combined with the glass pane. If these are only small parts, such as holding clips that can be easily singularized and gripped, then a handling robot is superior to human manipulation. In this case, we consistently rely on conventional horizontal machines and a linear robot with a combined insertion / removal head in combination with a 1+1-fold tool for a pair of windows. We insert the two glass panes and the small parts simultaneously and remove the finished pane modules with an additional stroke."

At hand of a slightly differently designed window module, he continues: "However, if larger, more complex inserts beyond the mostly circular inserts are to be manipulated and exactly positioned in the mold, we are over the limits of a horizontal production cell. As the positioning of long web bars precisely and holding them during the closing stroke is a tough job. That is why we produce these higher-integrated window modules on vertical machines with a rotary table in combination with human manipulation." At this point, production equipment manager Jens Hartmann adds: "After thorough market analysis, we finally decided in favor of the vertical machines from LWB-Steinl. The reason was that in the LWB-offer not only one but several vertical machine systems in scalable variants were available. This allowed us a shortcut to the appropriate system specification without having to compromise. It was a vertical, tiebarless C-frame machine in combination with rectangular designed rotary table system by LWB. That configuration provides the desired generous clamping dimensions and at the same time offers the best accessibility to the working area around the injection molding tool. (Fig. 3 and 4, as well as Factbox: LWB-C-Frame-Machine) With a clamping area of 1300 x 650 mm for each mold and an equally large center area with all media and energy connection, everything fits exactly to the glass overmoulding tools we use. In particular the tool set-up process benefits from the specific LWB rotary table layout. That was evident in comparison with an older vertical machine

with a conventional rotary table, still in operation in our molding production. Due to the short distance between the two tool sets, the space for the media connections is very limited, which results in significantly longer setup and maintenance shut downs." (Fig.5a+b).

Individually tuned machine concept

After the basic decision for the machine concept had been made, it was about the size specification of the injection capacity, clamping force and turntable. Due to the modular machine system, the required sizes and capacities of the individual components can be matched to each other within a wide range of variation. The result was a configuration specified as VCRS 2500 / SP 2000 b II. 250 tons clamping force hit a 180 degree 2-station rotary table with 2577 mm outer turning circle and a thermoplast injection unit with 2000 cm³ shot volume. The safety guarding around the work area offers an ergonomic beneficial 600 to 800 mm wide access on both sides along the turntable. Towards the front, the working area is safeguarded by means of a floor scanner, a light curtain and a high-speed door in order to obtain the optimum accessibility of the machine.

Rotary-table-injection-molding-machine is part of an integrated production unit

The LWB plant is part of a production cell in which the pairs of glass panes at the contact surfaces to the plastic are the run-up to the injection molding machine automatically coated with a primer and quality supervised (Fig.6). The glass panels coming out of the primer application cell on a conveyor are taken over by the machine operator by means of suction lifters and positioned in the tool cavities. He inserts the long web bar and the additional holding clips in the mold cavities and starts the injection molding cycle.

If the cell has to be converted to other disc models, this is possible in the short term because of the existing quick-connection devices for the upper tool half and the media supply.

Résumé

"Efficiency optimization can not be achieved exclusively by automating the handling processes around the machine," summarizes production manager Frank Hassel, adding: "In our case, efficiency optimization meant creating optimal conditions for the manual production work, needed in specific cases. For this, we were looking for a technology partner who is able to offer the appropriate machines and additional modules. The efficiency parameters regularly recorded in our production attest that this has been achieved with the LWB Steinl equipment." (Fig.7)

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Figures:

Photo: Author

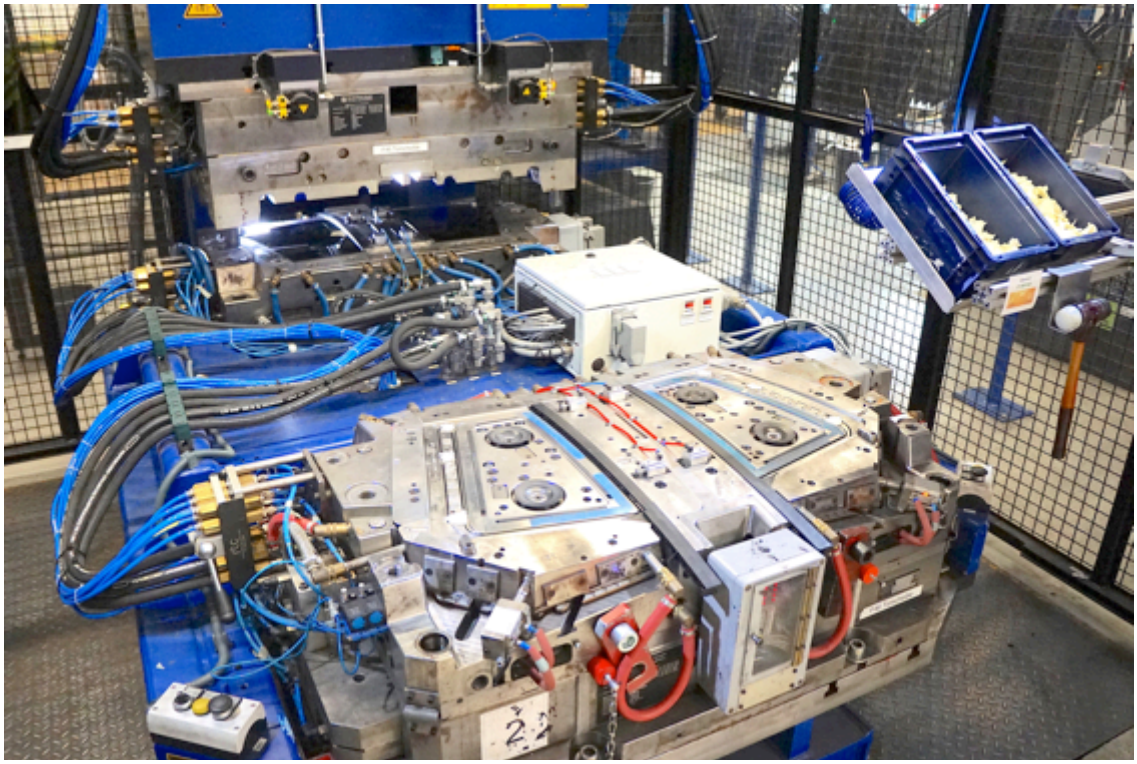
Fig.2: The rear door window modules, supplied to the automobile assembly line, consist of a glass pane and prefabricated inserts (crank window guide rail and mounting clips) which are assembled on an injection molding machine by overmolding a TPE-frame.

Photo: Author

Fig. 3: For assembling window modules of higher complexity by injection molding Henniges Automotive relies on vertical VCRS 2500 / SP 2000 b II C-frame injection molding units by LWB-Steinl with turntable unit. Due to an installation in a foundation pit, the machine-plant offers optimal access conditions to the injection side and the manipulation around the injection mold.

Photo: Author

Fig. 4: The generously dimensioned free space around the turntable creates ergonomically favorable conditions for part manipulation and tool maintenance.



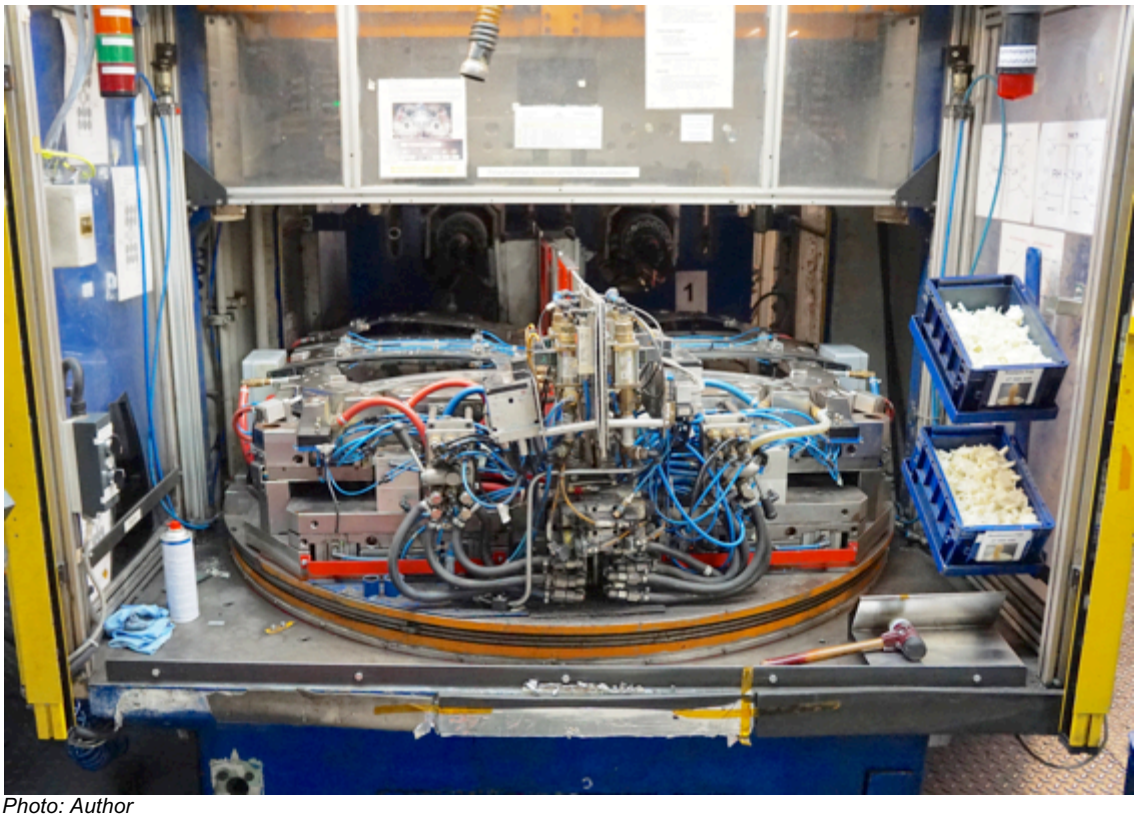


Photo: Author

Fig.5a + b: The comparison with an analogue installation on an older rotary table machine visualizes how "tidied up" the media and energy connections through the LWB rectangle turntable concept can be led to the two tool sets.

Photo: Author

Fig. 6: The LWB-plant is part of a production cell in which the glass sheets in the forerun to the injection molding machine are automatically coated with a primer at the contact surfaces to the molded-on TPE areas.

Photo: Author

Fig.7: The production team of Henniges Automotive affirms the correctness of the decision for LWB-Maschinentechnik. From left to right. Production Manager Frank Hassel, LWB Sales Manager Thomas Vodnansky, Application Technology Manager Norbert Aumann, Production Equipment Manager Jens Hartmann.

Infobox: LWB-C-Frame-Machine with Rotary Table Module

LWB-Steinl has been building vertical machines for the injection molding of window glass modules for more than 20 years and has developed a related modular component kit. This allows to react to the respective application without long project lead time.

The options
For the simultaneous overmolding of two panes of glass, e.g. left and right side windows, different machine concepts are available in several sizes. Which concept is ultimately used depends on the general conditions of the user or his preferences.

> C-Frame Clamping Unit + LWB Turntable Module
> Portal Frame Clamping Unit + LWB Turntable Module > 3-Tiebar Clamping Unit + Integrated LWB Turntable Module

All three machine variants can be designed for nearly the same production output, but have some significant differences..

Clamping unit: The most significant difference is in the structure of the clamping unit. However, due to its design, the C-frame machine is taller than the portal frame machine or the 3-tiebar machine and must therefore be either surrounded by a working platform or placed in a foundation pit. At the same time, the C-frame and the 3-column machines, offer the three side open access to the injection molds to the rotary table.

Injection side: All three machine variants can in principle be combined with one or two parallel injection units. However, the 3-tiebar-machine in the single-unit design is the most compact configuration due to the central injection through the upper machine platen.

Photo: LWB-Steinl

Fig.5: C-frame clamping unit in wide platen execution with closing from below

Turntable unit: The LWB turntable module differs from a conventional rotary table unit by in the rectangular table form with two tool clamping plates clearly separated from a central media supply area. The from three sides freely accessible rectangular tool mounting area in the machine ensures optimal accessibility of the injection molding tools for all set-up and service work.

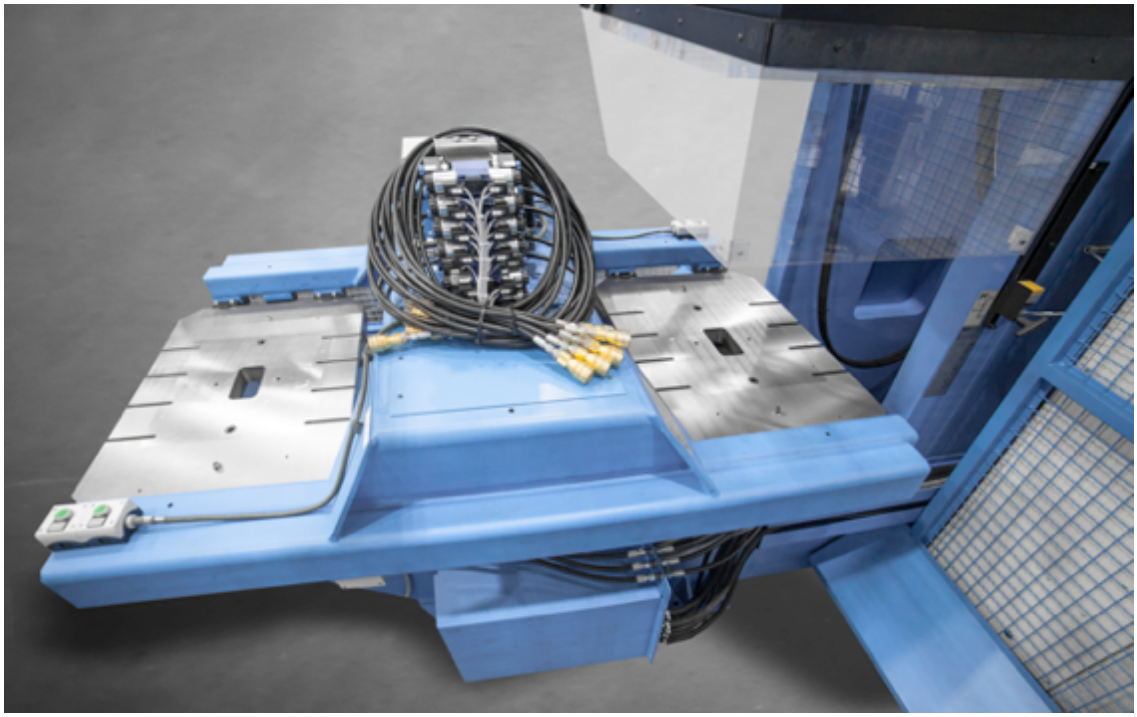


Photo: LWB-Steinl

Fig.6: LWB rotary table module, can be flexibly combined with different clamping units

about Henniges Automotive

Photo: Henniges

Henniges Automotive is a leading global supplier of advanced seal and anti-vibration systems for the automotive market

Henniges supplies original equipment manufacturers (OEMs) with sealing systems for doors, windows, luggage compartments, lift doors, sunroofs and hoods. In addition, the company supplies the automotive market with anti-vibration components and plastic-framed glass-window-systems. Headquartered in Auburn Hills, Michigan, Henniges sells to all major OEM automotive customers. In addition, the company has locations in North America, South America, Europe and Asia with over 8,000 employees worldwide.For more information see**:** http://www.hennigesautomotive.com/

about LWB-Steinl

Founded in 1962 by Alfred Steinl, the company started with punching tools and rubber processing machinery. Today, the company, still managed by the Steinl family, is one of the world's leading manufacturers of rubber injection molding machines. The product portfolio covers the complete range of rubber and plastic injection molding machines, from the vertical C-frame machine to vertical 4-tiebar or gantry-frame machines, to horizontal tiebar and tiebarless C-frame machines.

The company currently employs around 250 people and has about 500 machines per year, based in Altdorf near Landshut.

In 2011, LWB acquired a bio-material development and processing company and has since continued to run it as Biofibre GmbH. In 2013, the sealant developer and application machine manufacturer Dreibond was taken over. In 2014, the joint venture URP (United Rubber & Plastic Machinery Ltd) was established in China, for manufacturing machines for the local market. In 2015, LWB-Steinl entered into a cooperation agreement with REMA TIP TOP AG and founded VulcTech GmbH (manufacturer of repair presses for rubber conveyor belts) at the Landshut / Altdorf site. In the same year, the Steinl Group took over the Italian Prodicon International Srl. (Development of production of rubber batch-off plants). In 2017, with LWB Automation, a separate subsidiary for production automation in Germany has been opened, offering handling solutions focused on elastic components.

For more information see: www.lwb-steinl.de

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