

MOLD'N SEAL

With the onset of Industry 4.0 not only is the 'Internet of Things' in the foreground, but also the idea of maximum flexibility in production instead of conventional mass production. At the same time, the production concepts and methods of the plastic and metal-processing supplier companies of the OEMs are constantly being tested on their levels of efficiency.

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With the introduction of the Mold'n Seal process developed by Sonderhoff, Swiss company Weidplas was able to realize efficient production in large quantities in the smallest space. The objective was to integrate different production steps in an in-line production, without having to interrupt the production process and to temporarily store components.

The project goal issued by Weidplas to seal the parts installed in the passenger compartment with low emissions was achieved with using the FERMAPOR® K31 low-emission polyurethane foam gasket.

The automotive supplier and injection moulding specialist Weidplas, part of the international Techniplas Group, commissioned a number of companies for their efficient in-line production: Engel, one of the world's largest manufacturers of injection moulding machines, and the Sonderhoff Group, now part of Henkel AG & Co. KGaA.

Sonderhoff is an international system supplier and process specialist for the

sealing, gluing and potting of industrial components. At Weidplas, it was essential to maximize the process efficiency of the entire parts production, to minimize rejects and thus reduce production costs.

This could be achieved by the process integration of various production steps - the injection moulding of the parts and the sealing immediately afterwards in one cell. Now, the Mold'n Seal process runs as series production at the Weidplas plant in Röll, (CH).

Sonderhoff and Engel worked very closely together on the project implementation. Engel supplied the injection moulding machine, unloader unit and six-axis robot for injection moulding. Sonderhoff supplied the mixing and dosing system DM 402 with the precision mixing head MK 625, in the process version Mold'n Seal.

The Mold'n Seal process developed by Sonderhoff provides for a machine configuration that combines the processes of injection moulding with the immediate subsequent sealing of the components in

an in-line production.

This process-integrated manufacturing involves parts that are installed in the passenger compartment. The requirement was therefore to seal the parts with a low-emission foam gasket. Sonderhoff has realised this with the low-emission foam gasket developed for this purpose.

Plastic components and their seals must not emit pollutants such as volatile organic compounds (VOCs), even at extreme temperatures, such as those often prevalent in direct sunlight during summer. They can cause a health hazard beyond a certain amount.

Sonderhoff, experienced for years in the field of low-emission foams, meets with the low-emission foam gasket the requirements of the OEM test specification for foam-moulded, soft-elastic foams based on polyurethane set for this application. There, the target value for the VOC emission is set at 100 micrograms per gram of polyurethane.

The project for Weidplas is not the first time Sonderhoff and Engel have worked together. Even during Engel's in-house exhibition in 2012, the inline production of a component using the Mold'n Seal process was presented to the plastics processing supplier industry, explains Peter Fischer, Marketing Manager at Sonderhoff.

With Mold'n Seal, Sonderhoff developed a process that offers customers a cost and time-saving integration solution for injection molding and gasketing in the smallest of spaces. The DM 402 dispensing system used at Mold'n Seal can be flexibly adjusted to the customer's specific production situation, the design of the component to be foamed, and the property profile of the seal formulation.

By combining the injection molding system with the mixing and dosing system, Weidplas can save space, time, energy and thus costs. As a result, higher production output is possible with lower unit costs.

Uwe Westermann, Weidplas' Director Strategic Purchasing, said, "Due to the high volumes required, we did not want an interrupted process with intermediate storage of components. Therefore, this fully integrated inline system was the only correct and most efficient solution."

"From plant design to material development, we only had two contact persons during the realization with Engel and Sonderhoff Engineering, who constantly supported us in each phase of the project."

With the Mold'n Seal process integration at Weidplas, Sonderhoff and Engel implemented automation solutions with the highest possible level of automation in a production cell. The following systems are used:

Injection molding plant from Engel

Picking robot and six-axis robot from Engel

Sonderhoff mixing and dosing system DM402 with mixing head MK 625 and the mixing head reversing unit, which is moved electrically. The advantage: freely programmable stop positions on the movement path, instead of pneumatically with

fixed stop positions.

The plant periphery consists of:

An automatic refill station that pumps the A component of the FERMAPOR® K31 low-emission foam gasket and the B component into the respective pressure vessels of the dispensing system

Plasma nozzles for activation of the component surfaces for improved adhesion of the foam seal

A cooling and curing section and a conveyor belt.

And a temperature control unit: Due to the high reactivity of the fast-reacting low-emission foam system, the material pipes must be cooled leading to the mixing head.

The components are produced by Weidplas using a 2-cavity mold by injection molding. After removing the components from the injection molding tool, another component must be mounted. The supply of the components to the Mold'n Seal manufacturing cell has been designed such as that a refilling of the parts buffer takes place at reasonable time intervals.

Depending on the duration of the parts assembly and the pot life of the low-emission foam, the components can be removed from the assembly station by the picking robot and placed on the conveyor belt. At the same time, a low-emission sealing foam bead is applied.

In order to clarify how many individual processes in the Mold'n Seal manufacturing cell are partly parallel, they are described in more detail below. After injection molding with the Engel system, the tool opens and the removal robot removes two components from the cavities and moves them to the conveyor belt to deposit them there.

The remaining component is positioned at a plasma nozzle for plasma activation of the component bottom side.

After the plasma pretreatment, the removal robot places the component for further processing, moves to the injection molding unit again, waits there until the tool opens and withdraws two parts again.

At the same time, the 6-axis robot grips the component deposited at the storage / exchange figure with the plasma-activated underside and moves to the mixing head MK 625 of the dispensing system DM 402 from Sonderhoff. There it positions the component under the mixing head nozzle for foaming the plasma-activated side.

The mixing head MK 625 of the Mold'n Seal system from Sonderhoff precisely meters the low-emission seal foam into the groove of the component.

The 6-axis robot then moves the part with the foaming side facing upwards to the plasma nozzle to activate the unfoamed side with plasma. He then drives back to the mixing head to apply the second side with low-emission sealing foam. The 6-axis robot then places the finished foamed component on the cooling and curing section and removes a new part from the storage / exchange unit.

"One big challenge was certainly that the component has a seal on both sides and the surface must first be activated before the foam is applied," says Westermann.

To separate components that do not meet the defined quality standards (NIO parts), a conveyor system has been integrated into the overall concept, which uses slides to remove the NIO parts from the protective housing of the production cell.

Thanks to a simple and continuous operating concept, the Mold'n Seal system at Weidplas can be operated safely and ergonomically. Active functions and states are signaled by the illuminated buttons. Selectable functions / states are signaled by the flashing of the buttons. All malfunctions, process parameters and their changes are documented by the Mold'n Seal system and can therefore be traced at any time.

But the last control at Weidplas is the machine operator of the Mold'n Seal plant, which checks the quality of component processing.

The Sonderhoff Mold'n Seal process involves the inline processing of injection-molded components followed by direct application of a polyurethane seal in accordance with the FIPFG (Formed In-Place Foam Gasket) sealing technology. Injection molding and dispensing equipment as well as handling robots are placed in a production cell on a compact footprint of approx. 70 square meters. Thus, space, costs and time can be saved.

For Sonderhoff, the challenge for the use of the Mold'n Seal process at Weidplas was to design the formulation for the low-emission foam so that the foaming process to form a foam gasket would be adapted to the injection molding cycle specified by Engel.

With the fast cure foam seals FERMAPOR® K31 Low-Emission the component application

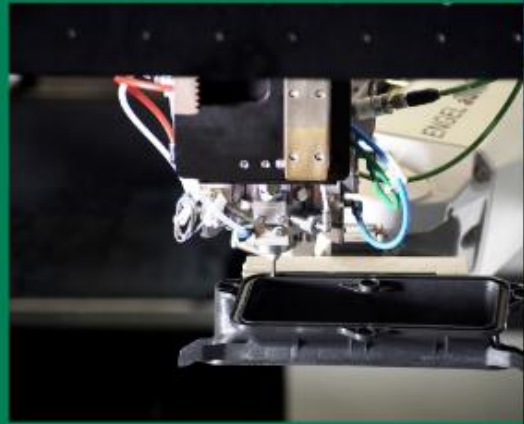
could be successfully implemented within the injection molding cycle.

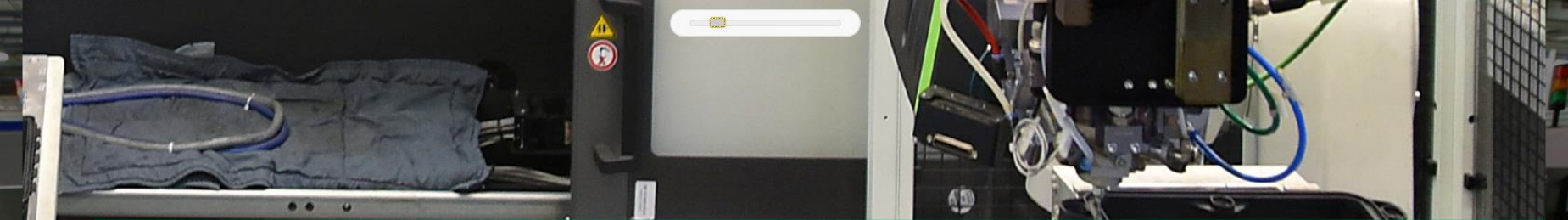
After 2-3 minutes at room temperature, the surface of the foam seal is tack-free and the foamed components can be processed quickly. Buffered or pre-produced injection molded parts and an expensive

intermediate storage can therefore be left out. Also, thanks to the short tack-free time only short conveyor belts are required.

By integrating the processes of injection molding and foam gasketing, it is possible to save considerable time in the entire production process at Weidplas. The assembly and further processing of the components can start earlier. The high degree of automation in the Mold'n Seal manufacturing cell also means lower labor costs and, as a result, higher manufacturing output at lower unit costs.

Thanks to the high level of process engineering expertise and the many years of expertise of all the companies involved in the project, the compatibility of the challenging material properties, coupled with a modular and compact system concept, has been successfully implemented in a high-wage location such as Switzerland.





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And a temperature control unit: Due to the high reactivity of the fast-reacting low-emission foam system, the material pipes must be cooled leading to the mixing head.

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