

Hot and Cold Fronts in Rapid Cycle

Variotherm Mold Temperature Control Allows Precision Reproduction of Extremely Fine Structures with Top Surface Quality

In injection molding, the cyclical interplay of heating and cooling the cavity surface opens up completely new opportunities for surface design. If the rapid temperature cycles are controlled such that they take place at the correct time and place, even intricate structures can be perfectly reproduced – in one step and with no post finishing.



With precise molding of filigree, at times holographic, textures – with direct connection to the visible surface – the sample component by RocTool is setting new standards in high-quality plastic finishes (© RocTool, Incoe)

This is not a film, this is how it came out of the mold”, Peter Wentzel, Sales Manager Europe of the French toolmaker RocTool, headquartered in Le Bourget du Lac, explains to the astonished beholder of a sample component with a remarkable finish. To exclude all possibility of doubt about the development of a holographic effect, the expert for injection molding adds that there is no reworking whatsoever required – no paint required for this design. “All in a single shot!”

At Fakuma 2015, RocTool did not have an easy task of convincing the nu-

merous visitors of the products and product finishes that can be produced using the patented 3iTech process. In the patented process, the mold surface is heated very rapidly by electromagnetic induction. And how can you use the process to put a hologram on the surface? What kind of mold do you need to accomplish that?

“The key to these outstanding product properties lies mainly, but not exclusively, in our process”, Development Manager Stephane Quilliet explains. The technology network of all project partners is

required not only to make this result possible, but also to ensure the kind of consistently high quality sought in and typical for series production of automotive parts. A “Chapeau!” for small and medium-sized enterprise in Europe:

- Schöfer GmbH, Schwertberg, Austria, is a supplier of precision injection molds;
- GF Machining Solutions GmbH, Schorndorf, Germany, is a specialist for laser texturing, e.g. of mold surfaces;
- with its Balitherm Primeform diffusion process, Oerlikon Balzer Coating »

Germany GmbH, Bingen, provides perfect demolding;

- the hot runner system from Incoe International Europe, Rödermark, Germany, ensures a consistently reliable, temperature-controlled process start at the valve gate; and
- Krauss Maffei Technologies GmbH, Munich, Germany, provides optimum

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process sequencing of the injection molding process.

RocTool chose this process carefully in order to invest its technology in a product with high reproduction capability. In its cooperation with customers, it ensures that it keeps the initiative. Every project begins with a feasibility study. If the project partners agree, then in-house specialists provide complete engineering, calculate the entire process and optimize it, replete with simulation, inductor positioning, cooling etc. A 3-D model is then supplied to the toolmaker with integrated RocTool technology.

Feed System with Uniform Mold Filling

The customer is involved right from the start in order to carry out its wishes through every step of the process, particularly where optimization is concerned. The finished mold always begins conventionally at first. If everything runs according to plan, the inductors are switched on and precision adjusted to heat the finely textured mold surface. The customers' staff, who have been trained in advance

by RocTool, can thus take over as from the start of production. Asked whether the effort is absolutely necessary, Peter Wentzel responds with a resounding "Yes. It's the most cost-effective and fastest way. After all, it's a sensitive process."

The interplay of complex induction heating with conventional water cooling performs the thermal management within the mold cavity – the core competence of the French technology firm. Juggling hot and cold fronts requires a constantly reproducible initial situation that the gate system must ensure through uniform mold filling. The initial temperature of the melt must also meet specifications, because there is no way to correct deviations.

"We have to be able to rely on our hot runner suppliers 100 percent", Peter Wentzel clarifies. Irregularities would be unmanageable, the scrap intolerable. For Incoe Development Director Christian Striegel, for whom the proper functioning of hot runner technology is a matter of course, the statement comes as a pleasant surprise. He adds: "This example makes the importance of the hot runner for stable conditions at the valve gate particularly clear." ■

Complete System Consisting of Dosing Machine and Mold Carrier Press

Truck Steps Produced by In-Mold Coating

Hennecke GmbH & Co. KG in Sankt Augustin, Germany, and Indupol International nv, in Arendonk, Belgium, worked together designing a plant to manufacture steps from rigid polyurethane (PU) foam with varnished surfaces for truck driver cabs.

A particular challenge was the mold geometry of the 3-D cavity, making it difficult to fill the mold with the PU material. BASF SE in Ludwigshafen supplied the raw material, while Bomix Chemie GmbH in Telgte, both Germany, provided the

varnish and the release agent. Together with these two companies, several test series were conducted to find the best suited production process. This involves the reactive mixture filling the cavity reliably when fed into the closed mold. Immediately after curing, the varnish is applied by in-mold coating.

Several tests were carried out on sample components. After that, the truck producer finally gave the go-ahead for serial production. Machine and plant producer Hennecke supplied the high-pressure Topline HK dosing machine, the IBC container station and the mold carrier press as a complete solution. The mold carrier press was provided by AutoRIM Ltd. in Derbyshire, England.

The mold of the truck manufacturer is designed as a dual cavity so that both sides, i.e. the driver's and passenger's, can be manufactured in one cycle period. Due to the complex geometry and due to the design with grained surface, the mold is

equipped with hydraulic extractor rods to facilitate demolding. A type MT18-2 transfer mixing head safeguards good mixing quality and raw material efficiency. The high-pressure PU dosing machine, HK470/470, supplies the reaction mixture. The machine is designed for a maximum output of 940 cm³ of mixture per second. A mold carrier from the MG series opens and closes the mold. The press is designed to handle molds up to 2t in weight. Industrial safety systems with laser scanners and light curtains guarantee the necessary labor safety. When opening, upper and lower mold plates pivot towards the operator, making it easier to remove components.

Cycle time is 5 min, approximately. This comprises 4s shot time and 120s for curing of the PU mixture. Subsequent application of varnish takes approx. 2min, until final curing.

To the manufacturer's product presentation:
www.kunststoffe-international.com/1321965



The figure shows the production of a truck step (© Hennecke)