Appliance maker Rowenta uses conformal mould cooling in multi-component iron bodies produced at its plant at Erbach in Germany to improve part quality and production economics.

Ironing out problems

The Rowenta division of appliance maker SEB is proud of the ‘Made in Germany’ branding its ironing products carry. But manufacturing in a high-labour cost location such as Europe means making full use of automated production technologies – as well as novel designs – to keep cost down and to deliver products that consumers want to buy.

“The average buyer makes an initial choice based on appearance. If they like something, they pick it up – so the handle is a key element of the iron. Only then do they take a closer look at the functions and performance details,” says Rowenta project engineer Klaus Maier.

A typical iron is made up of some 150 single parts. Plastics components include the soleplate heat shield, which is produced in a thermoset BMC, and the handle and reservoir. Handles and reservoirs are generally made in PP at Rowenta, with dials and switches produced in PC.

The handle parts, together with the rear cover and thermostat controls, are manufactured in the company’s dedicated plastics production facility at Erbach in Germany. “The handle is key to a purchasing decision,” says Maier. “If it feels substantial in your hand, that’s the mark of a good iron.”

Rowenta has been making extensive use of two and three-component moulding and conformal cooling technology to help it to minimise manufacturing costs for close to a decade. Maier says the company produced its first three-component (3K) parts in 2004, using conformal cooling techniques in key areas of the complex mouldings from the outset.

Compared to assembling individual moulded parts, the multi-component manufacturing approach reduces assembly requirements, improves functional integration, allows better quality to be achieved, and results in shorter cycle times, Maier says. Replacement of several individual processes with one – albeit it more complex – manufacturing step also results in reduced cost.

Rowenta uses a variety of multi-component techniques, including turning plate systems, rotary table tools and indexing plate technology. In general, rotating tools are the preferred choice, he says, as this approach keeps the injection-moulded part on the core during the subsequent overmoulding stages. However, the final decision is made on the engineering strategy that best suits the particular iron model – a turning plate design allows a three-component solution that would very likely be too large for the clamping dimensions on a rotary table, he says.

The tooling decision will also take into account factors such as capacity planning and batch size. Irons are produced in a number of different colour combinations and, perhaps surprisingly, it is a cyclical business in demand terms. “Six model series translate to about 60
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different individual models. And the model cycles are shorter than you’d expect – a new range is added every four years,” says Maier. “Fewer irons are bought at the beginning of the year. Then we manufacture about 6,000 irons a day. But later in the year, that number jumps to between 9,000 and 10,000.”

As Rowenta carries out its moulding in-house, it is able to use multi-component technology that is highly customised. The aim, according to Maier, is to automate anything that can be on each production cell.

Conformal cooling is used in the most critical parts of the tools – sections with complex ribs or where space is restricted – to ensure the tight dimensional control required for trouble-free automated module assembly. The company uses conformal cooling tool inserts produced using the LaserCusing technology developed by Hofmann Innovation, integrating these into conventionally-built and tempered moulds.

Hofmann’s LaserCusing system [which is marketed by its Concept Laser subsidiary] uses an additive building process that creates a mould insert layer-by-layer from metal powder melted together by a laser. It is claimed to create a 100% fully dense metal component and is said to be able to process a range of stainless and tool steels.

The additive building technique allows cooling channels to be placed close to the mould surface and to follow the surface contour – conformal. Typically, cooling channels of around 5mm diameter are used and are placed between 2-3mm of the surface. Hofmann claims that, when applied selectively in a mould tool, the use of LaserCused inserts is cost neutral.

For engineering and functional reasons, irons are well suited to the application of conformal cooling due to the pronounced ribbing in the front area. “The key benefit is the lack of distortion. It accounts for the positive assembly characteristics, that is, the excellent dimensional accuracy of all the different mandrels and metal tubes that have to fit perfectly,” says Maier.

In a three-component part, there are clearly identifiable cycle time improvements, too. Hofmann Innovation claims typical cycle time reductions of between 10 to 30%. Maier says start-up is also much faster, with the required dimensional accuracy achieved very quickly.

With close to a decade of conformal cooling experience, Rowenta has developed a good understanding of how to get the best out of the conformal technology. Maintaining a high volume of coolant flow is essential and corrosion inhibitors are used to prevent build-up of sediment and particulate contamination.

Coolant channels also have to be appropriately sized and positioned – parallel cooling is used at particularly challenging points to ensure maximum cooling of the cavity surface. This is all determined during the product development process and carried out in conjunction with the project managers and engineers at Hofmann Tool Manufacturing.

Irons are subject to safety checks by national or international testing organizations, such as the VDE, GS or UL inspections. The majority of checks are carried out at Rowenta to shorten the release time. This requires a certain degree of flexibility from all involved. Toolmakers, such as Hofmann, are brought on board in the very early stages of a project and remain involved throughout the development process.

“In a standard range, this means about 12 months of project time, from design studies through model making to the finished series-production tools. For an innovative product with new electronic functions, a project of this kind could last up to 16 months,” says Maier.

For more information:
\[ www.hofmann-innovation.com \]
\[ www.concept-laser.de \]