Teamwork Produces a New Design

Development of a Polystyrene Housing for TV Sets

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Collaboration between a television manufacturer, plastics supplier and injection moulder beginning at the product development stage rapidly led to the cost-effective development of a sophisticated design with the appropriate polymer.

With consumer prices falling between 7 to 10% every year, the European television market has to be very cost-conscious. Manufacturers are constantly looking for new ways to reduce manufacturing costs or increase product differentiation through technology or design. Many of the 25 producers active in Europe combine several of these methods to combat falling prices and remain competitive.

Loewe AG, Kronach/Germany, took its expertise in the development of high-quality products, which are substantially

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different from other products on the market, and combined it a new polymer and collaboration with its suppliers to help produce a very innovative design. Loewe manufactures approximately 400,000 television sets per year, concentrating on offering very high quality products that are differentiated from others by their design and technology. German retailers of consumer electronics voted the company Top Brand 2000.

The latest "Vitros" product line (title picture) is the result of intensive teamwork between Loewe, Videoplastic S.p.A (an injection-moulding company) and The Dow Chemical Company, which supplied the new high-impact polystyrene (grade: Styron A-Tech 1400).

"Vitros" is Loewe's second line of television sets featuring a flat picture tube in combination with 100-Hz MediaPlus technology for totally flicker-free images and internet access. These TV designs presented new challenges for the product design department at Loewe, for the mould maker and the injection moulder.

The design concept for the "Vitros" is based on embracing the viewer. The gentle "outward curves" of the cabinet towards the viewer emphasises the flatness of the screen and the fluidity of the entire (Fig. 1). This creates an appealing aesthetic and a sense of ease.

Complex Design

High quality specifications and tight project scheduling further compounded the difficulty of producing this top-quality product.

The design of the front cabinet necessitated a mould with 10 moving cones with a nominal wall thickness of approx. 5.5 mm. The unique concave design of the front panel meant that wall thicknesses in some curved areas were as much as 12 mm. However, there were also wall thicknesses of just 3 mm and ribs as thin as 1.5 mm (Fig. 2). To be able to process such variations in wall thickness, the polymer had to provide good flow for the thin regions, as well as solution for cooling in thick areas. The injection moulder determined that gas-assisted injection moulding would achieve the specified production rate, but controlling the gas for such a variation of wall thicknesses proved a major challenge for the mould maker.

The back cover was designed with a large number of holes and had structural ribs under the top surface. Just like the various wall thicknesses for the front cover, the back cover also required a material with very good flow properties. In addition, the mould design had to allow good process control to avoid warpage along the top edge.

After the design was finalised, the mechanical department at Loewe converted it into a 3D computer model, which was then used to make the mould. This 3D model facilitated faster, easier communication between Loewe, Videoplastic and Dow for flow analysis and the complex machining of the two moulds.

Moulds Construction and Parts Production

The complex housing could only be produced by using gas-assist injection moulding which made it possible to create the unique concave shape of the "Vitros" TV set. Dow performed mould-filling analyses and confirmed that Styron A-Tech 1400 advanced polystyrene resin easily filled the mould and, additionally, had the strength required by the large cabinet design. A single injection gate minimised the problems of filling the mould and ensured a more even filling pattern. Gas-assist injection moulding helped to fill the part completely and uniformly and allowed proper cooling. After a few initial parts were produced during moulding trials, the team achieved the desired result.

The intense cooperation between Loewe, Videoplastic and Dow, the "Vitros" product was introduced eight weeks earlier than products developed with conventional procedures.

The "Vitros" television set is available in dual colours (platinum/graphite and steely blue/graphite). These colour combinations were obtained by surface coating. In all cases, Styron A-Tech 1400 polystyrene demonstrated maximum compatibility with all coating techniques employed.

Polystyrene Fulfils Many Requirements

Styron A-Tech 1400 polystyrene resin was introduced last year by Dow for a broad variety of consumer electronics applications. It offers a new combination of properties ideal for injection-moulded parts of all sizes. The resin provides the strength required by large applications, such as television sets, as well as the high flow properties necessary to fill complex parts. With a wide processing window, it can be processed at much lower pressures than conventional polystyrene grades. This reduces parts costs with shorter cycle times and lower energy costs.

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Fig. 1. A novel flat television screen is notable for the gentle "outward curves" of the screen toward the viewer (3D computer model)

Fig. 2. The unique concave design of the front side of the television set shows considerable fluctuations in wall thickness, that demand a high flow polystyrene grade (3D computer model)