From the TMG Solutions Archives: Co-Injection Molding Analysis

Keywords - Furniture, Flow Leader, Co-Injection

Problem

An injection molder needed to determine the feasibility of using a co-injection molding process to reduce the manufacturing cost of a plastic chair. The chair was to be manufactured using a virgin talc-filled polypropylene for the skin resin, and a regrind talc-filled polypropylene for the core resin. In order to justify the higher cost of building a co-injection mold the chair had to consist of at least 30% regrind.

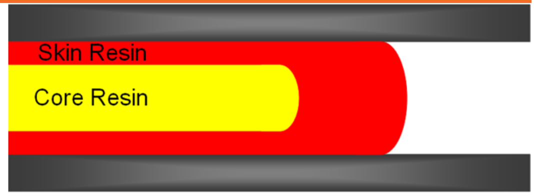

Figure 1: Co-injection molding sequentially injects two different resins to create a sandwich structure that hides the core resin between two layers of skin resin.

Evaluation

The molder hired The Madison Group to assist in evaluating the feasibility of manufacturing the chair and achieving the desired regrind core content when using the co-injection molding process. Co-injection molding, or sandwich molding, is a multi-material sequential injection molding process that allows for the core resin to remain hidden between the skin resin layers on the surface. The Madison Group used Autodesk Moldflow Insight to simulate the co-injection process.

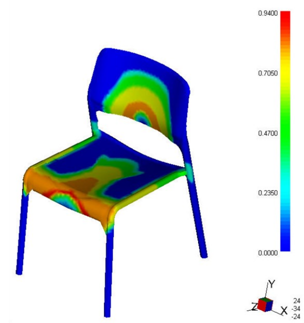

Figure 2: Simulation allowed the distribution of the core resin in the molded part to be visualized and revealed the original geometry would not allow for desired cost reduction to be achieved.

Two-fan gates were used to manufacture the chair. One gate located at the front edge of the seat, and the other at the bottom of the back rest. The initial mold filling simulation revealed that the flow hesitated in the back rest and restricted the window in which the core resin could be injected without becoming visible on the surface of the part. This flow imbalance prevented the desired cost reduction to be realized.

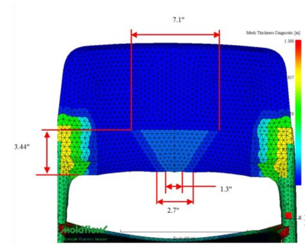

Figure 3: A flow leader was added to the back rest that allowed the core resin to be injected earlier during the filling stage.

Therefore, The Madison Group developed a flow leader on the back rest that balanced the fill between the back rest and the seat. The increased thickness of the back rest created a more balanced fill pattern, and allowed the core resin to be injected earlier in the mold filling stage. The addition of the flow leader helped increase the percentage of the core resin in the final molded part from 28% to almost 40%, and allowed the customer to realize their desired cost savings.

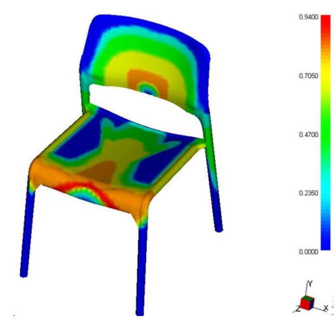

Figure 4: The addition of the flow leader allowed for greater penetration of the core resin into the part, and allowed the customer to realize their desired cost reduction.

Conclusion

It was the conclusion of the evaluation that the original chair design created an unbalanced filling pattern that would not allow the customer to achieve their desired cost reduction. The use of simulation allowed for a flow leader to be developed, which allowed the desired cost reduction by balancing the filling pattern and allowing for more core resin to be injected into the mold.

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