

MeltFlipper® Case Study

Annual Savings = \$30,560 * 100% Cavity Utilization

"...MeltFlipper technology reduced the dimensional variation from 0.2mm down to 0.05mm."

- Osram Sylvania

Case Study:



Case Description: Solving dimensional variations in a 4-cavity parting line inject, automotive connector using MeltFlipper® technology.

A customer approached BTI with a 4-cavity parting line inject tool which exhibited a distinct pattern of dimensional variation. The project was part of a multi-million dollar automated work cell. However, the customer discovered that every other cavity was dimensionally identical. Cavities 1 and 3 were identical in dimension, but different than cavities 2 and 4. The dimensional variation was 0.2mm in the critical feature of the part, causing a 50% scrap rate and much higher production costs - especially since the parts were insert molded with expensive metal components (Figure 1).



Figure 1: Illustration of the automotive connector. The arrows illustrate the critical feature dimension.

In order to understand and try to solve the variations, the customer tried numerous ideas. The first of which was to interchange cavities 1 and 3 with 2 and 4, along with other matrices of cavity combinations. In either case, the variation showed identical for each scenario tested - cavities 1 and 3 were dimensionally different from cavities 2 and 4.

Next, the customer tried to artificially balance the "naturally balanced runner" in an attempt to influence the flow characteristics in the cavities. But this caused overcompensation of filling with two cavities and did not solve the dimensional variation (Figure 2).

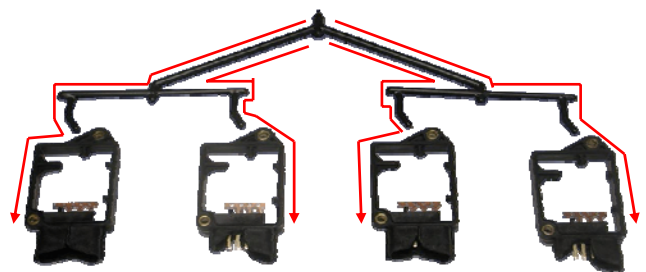


Figure 2: 4-cavity parting line inject runner layout modified with artificial balancing techniques, which overcompensated filling to cavities 1 and 3.

BTI analyzed the runner and noticed a pattern develop between the positions of the high sheared laminates in the cavities versus the dimensional variation pattern in

the mold (Figure 3). BTI then applied MeltFlipper technology to manage the flow into and across each cavity. Instead of having high-sheared material on the right side of two cavities (and different flow lengths on the right versus left side), the high-sheared laminates would no be flowing through the center of the parts so that the flow would be identical in each cavity. This eliminates the influence of flow length in combination with the position of the high-sheared laminates on the dimensional variations within the parts (Figure 4).

The results of MeltFlipper technology reduced the dimensional variation from 0.2mm down to 0.05mm, well within the part's specifications. Now all cavities were running 100% in production, thus lowering the final part cost.

The reason the artificial balance did not achieve the solution is that by changing runner/gate sizes only provides a limited pressure balance. The pressure balance CANNOT influence the material property differences found within each cavity. This can only be achieved through melt-management methods offered by the MeltFlipper technologies. This is further illustrated in the case study "Effect of Shear on Glass Fiber Lengths" and "Shear Influence on Gas-Assist Molding".

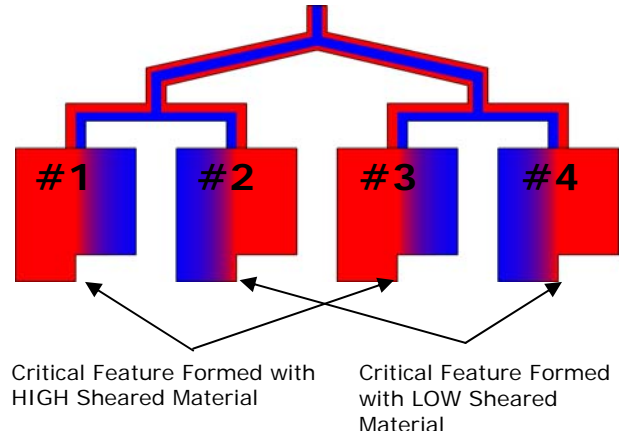


Figure 3: High shear laminate trace through the runner system and into the part/critical feature areas.

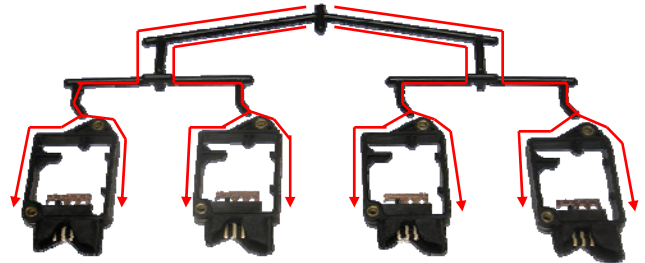


Figure 4: Uniform filling pattern and dimensional results between all 4 cavities achieved through MeltFlipper melt-management technology.