

## MeltFlipper® Case Study

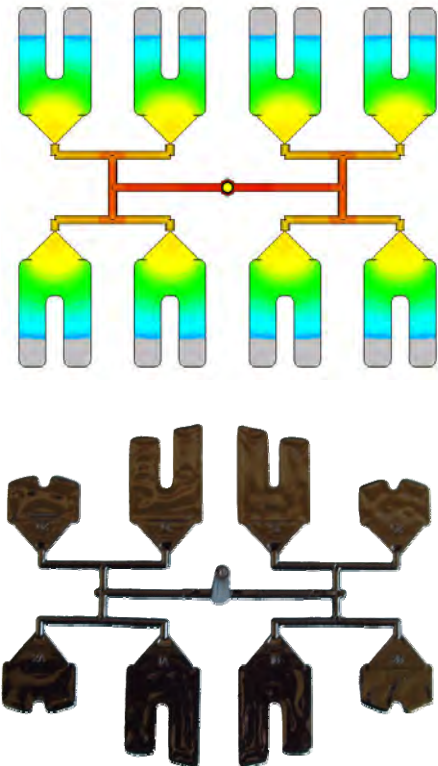
### Case Study: MeltFlipper® technology benefits mold filling simulation

Due to the simplified approach of most common mold-filling simulation software, the shear influence on the polymer flow is not diagnosed properly. The use of simple 1D beam elements and 2D or 2.5D technology assumes the melt conditions are symmetrical across a runner section. This node-to-node flow simulation approach shows uniform cavity filling, material temperatures and pressures from cavity-to-cavity that does not correlate with the actual molding results. Currently, even the 3D simulations commercially available to the plastics industry do not predict the shear phenomena properly. Figure 1 (top) is an 80% short shot output from flow-analysis software. From this figure, two items are important to note:

1. All 8-cavities are filling at the same rate.
2. A radial flow front pattern is developed from each gate and fills uniformly throughout the part.

This output is compared to Figure 1 (bottom) showing actual short shot results from a production mold. By comparing this figure to the output of the flow analysis, it is important to note two items:

1. There is a distinct separation of flows between the inside four cavities and the outside four cavities, creating a non-uniform filling pattern from cavity-to-cavity due to shear variations created in the runner system.
2. The inside cavities show a distinct non-radial flow pattern due to the influence of the shear from side-to-side within a cavity.

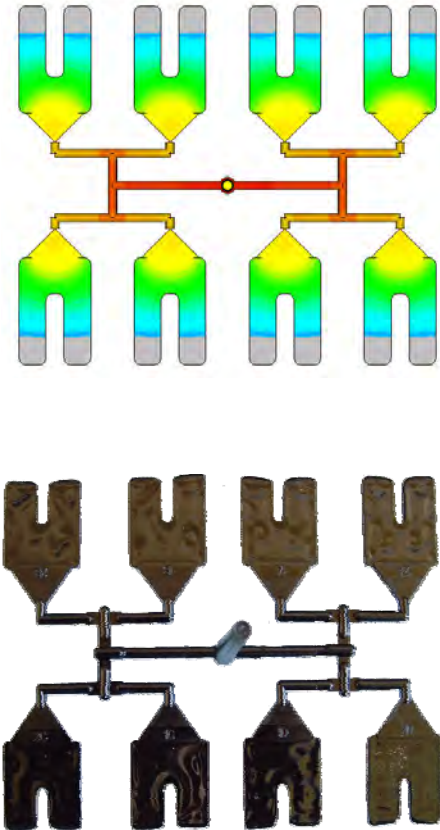


**Figure 1: Top** - Flow analysis 80% short shot results showing uniform filling to and within each cavity.

**Bottom** - Actual molding 80% short shot results showing non-uniform filling to and within each cavity.

Figure 2 compares the same 80% short shot analysis results to the same 8-cavity mold after being retrofitted with the MeltFlipper technology into the runner system. As can be seen, the MeltFlipper runner system controls the non-uniform shear-variations in the melt to create uniform filling between all 8 cavities. For the first time, the industry can truly achieve a naturally balanced runner - both geometrically and rheologically. By implementing the MeltFlipper technology into today's runner systems, flow analysis results are predicted more accurately to every day production molding. Without using the MeltFlipper runner systems, a company is risking inaccurate flow analysis results which may be detrimental to the performance of the production mold.

It can also be noticed that the side-to-side variations in the inside cavities are greatly reduced since the shear variations are distributed across the outer cavities as well as the inside cavities. Though some intra-cavity imbalances may still exist, they could easily be addressed and managed through an additional melt rotation at the following intersection. By adding MeltFlipper technology, a molder now has full control over the melt by managing how the material flows both through the runner system and within each cavity.



**Figure 2: Top** - Flow analysis short shot output results showing uniform filling to and within each cavity.

**Bottom-** Actual molding results showing uniform filling 'to and within' each cavity as a result of melt-management by incorporating the MeltFlipper technology in the runner system