



Cycletime Tips – Automotive

Volume 27: Flexible Polyurethane Design

Thermoplastic Polyurethane (TPU) is a unique polymer that can come in both rigid and flexible forms. Due to its unique clarity, compressive properties, abrasion, and chemical resistance, it has developed a firm stronghold in our industry. In the elastomers world, applications requiring one or all of these properties can expect prime performance from this material. Often times, with unique properties we often find challenges in other areas. In the case of TPU, it tends to be in processing. The scenario which is least compatible would be multi-cavity tools having thin part wall section. As you might guess by that description, this elastomer is very viscous. This tip is dedicated to helping you plan for these challenges.

Filling the part is a primary concern with this stiff-flowing nature. While mold-filling simulation is helpful, generally speaking you will need to stay below 75:1 on the flow path-to-thickness ratio in a single cavity mold. Gate thickness dimensions approach 75% of the wall to which we are attached.

Part release is a huge hurdle to overcome when automation or operator handling is required. Effective material drying is critical in maximizing part release and final part properties (<.02% moisture content). Flexible TPU tends to stick to mold steel quite well. While some product offerings are available with mold release compounded into the product, part sticking can still be an issue. This can produce more of a haze in the final part. As a rule, we want to hone/stipple the surface that we don't want the part to stick to (<45D durometer). This used in conjunction with staged and "A" half ejection can also be of help. When robotic extraction isn't available, air blow off can also assist in producing an "automatic" cycle. Mold coatings and additional release agents also have shown positive results.

Working with your tool shop to maximize part release needs to occur early in the development process. That coupled with a good drying regimen should improve your chances for success on the production floor. Please let me know how I can help.

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