

PolyOne's range of OnFlex™ thermoplastic elastomer (TPE) compounds includes TPE-S, TPE-V, TPE-O and TPE-U. This range, combined with excellent experience in TPE application design and processing, positions PolyOne very well to address the overall thermoplastic product needs of various industries.

This document provides general advice on injection moulding tool design for use with PolyOne OnFlex™-V Injection Moulding compounds. The information provided in this document is intended only as a guide to use together with your past experience of mould design techniques where applicable, using these materials. Our staff will be happy to assist in any areas where this document does not provide a satisfactory solution.

PolyOne's TPE compounds normally perform well in conventional moulds, and can usually be used in moulds designed for other materials with little or no mould modification. However, some basic considerations should be taken into account when designing a mould specifically for OnFlex™-V Injection Moulding compounds. The key consideration should be the rheology of these compounds because their viscosity is highly dependent on shear rate. Best processing generally is achieved when high injection speeds and pressures are used; thus, the mould should be designed to permit filling of the part with high injection pressure.

SPRUES

Standard sprues with a draft angle of 2.5° typically are suitable for moulding OnFlex™-V Injection Moulding compounds. Standard "Z" type sprue pullers, however, are often not suitable for softer compounds. In this case, undercut "fingers," reverse taper cold wells and slot bar pullers are recommended.

RUNNERS

Full-round runners are preferred for OnFlex™-V Injection Moulding compounds. Other designs such as half-round or trapezoidal runners can also be suitable, but are less efficient for transport due to their higher surface area per cross section, and could lead to problems in certain tool designs. Secondary runners should be full-round, and slightly smaller in diameter. It is preferable that the secondary runners branch off at right angles from the primary runner, and that these are all the same length to ensure balanced flow.

GATE DESIGN

Whilst OnFlex™-V Injection Moulding compounds will normally process well on conventional moulds, gate design is one of the main causes of moulding problems with TPE materials.

Generally, the gate should be just large enough to fill the mould – normally half the maximum part thickness, not less than 0.7mm diameter – and the land length as short as possible whilst still achieving efficient freeze off. Gates should be full-round, and should impinge directly onto a cavity wall or core pin to provide the best surface. Submarine and winkle gates give the best results with soft grades, but tab and film gates can be used provided they are large enough. Square gates and sharp shut downs should be avoided, as these can cause problems when the melt is injected at high speeds.

VENTING

Because high injection rates are normally used with OnFlex™-V Injection Moulding compounds, venting is particularly important. Without sufficient venting, problems will be encountered with the melt super-heating entrapped air, leading to burning and streaking of the surface. Vent sizes must normally be in the range of 0.01 to 0.02 mm deep, located at the final point of fill. Venting is best added after trials to determine the optimal location.

EJECTION

Ejection of OnFlex™-V Injection Moulding compounds can be problematic due to the low hardness and high friction of these compounds. Special care should be taken when designing the ejector system, which may be different for grades of different hardness. For soft grades, stripper plates are recommended for the most reliable ejection. Compressed air may be necessary to assist demoulding of deep-draw parts. If used, ejector pins should be as large as possible and push against wall sections providing the greatest support, to avoid warping the part.

To improve mould release, a textured surface is recommended. Draft angles of 0.25° to 1° are suitable for most parts. A tungsten disulphide coated surface can improve mould release. Reduced mould temperatures after pressure and a longer cooling time can also help improve mould release. Silicone-based mould release additives are not recommended, as their buildup can cause fouling and contamination issues with prolonged use.

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