Tips for Injection Molding
INEOS O&P Polypropylene Resins

This tip sheet is intended to provide suggested starting conditions for injection molding of polypropylene resins, but is not intended to be an all-inclusive guide. While many factors such as part design / mold design, venting and gate types, including location, have a large influence on part quality, processing conditions are equally important. For more in depth information, please see the INEOS Polypropylene Processing Guide, also available on our web site: www.ineos-op.com.

Suggested Starting Conditions:

Nominal Melt Flow Rate	g/10 min	2 - 10	10 - 20	20 - 35	35 - 50
Melt Temperature	F	475 +/- 5	465 +/- 5	460 +/- 5	455 +/- 5
Zone Settings					
Rear	F	380 +/- 10	380 +/- 10	380 +/- 10	380 +/- 10
Middle	F	435 +/- 10	430 +/- 10	420 +/- 10	420+/- 10
Front	F	450 +/- 10	440 +/- 10	430 +/- 10	430 +/- 10
Nozzle	F	475 +/- 10	465 +/- 10	455+/- 10	455+/- 10
Mold	F	50 - 100	50 - 100	50 - 100	50 - 100
Injection Pressure, 1st Stage	psi	800 – 1,500	800 – 1,500	800 – 1,500	800 – 1,500

It is expected that these conditions will be systematically adjusted to achieve the best overall balance between cycle time, part quality and part performance. Equally important is that some grades of specialty polypropylene products can contain additives like state-of-the art nucleators and clarifiers that could warrant even hotter melt temperatures in order to extract maximum benefits and or limit molded-in stresses.

General Process Information:

Equipment

Polypropylene can be molded in standard single-stage screw molding equipment without alterations. Although pre-drying is not necessary under normal conditions, it may be required for certain filled polypropylene resins.

Melt temperature

Best results are obtained when polypropylene is molded at temperatures ranging from 400 F up to 500 F. Melt temperatures should be 25-50 F higher than the minimum temperature required to fill the part. Too high of a temperature can cause problems with excessive flashing and burning and with shrink phenomena such as sink-marks, warpage, shrinkage, and void formation. Brittle parts also can be caused by either too high or too low of a temperature. Too low of a temperature can promote flow marks, weld lines, poor surfaces, lamination, short shots and undesirable molded-in stresses.

Injection pressure

The proper injection pressure depends largely on part size and configuration. Pressures usually range from 800 to 1,500 psi. 1st-stage pressure should be high enough to fill ~99% of the part and to avoid problems with shrinkage, voids, sinks, and short-shots. Too much pressure can cause parts to flash, burn, and stick in the mold or warp.

Injection time

Injection time could, in some cases, take up a good portion of the overall cycle. Injection time plays a relatively minor role in controlling warpage as compared to its major role in the managing or controlling shrinkage.

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Mold temperatures usually range from 50-150 F and should be high enough to produce good part surfaces, and minimize molded-in stresses. Temperatures should not be so high however, that shrinkage, warpage, sinking, and cavity or core sticking become problems. Mold cooling should be uniform unless differential cooling is needed to reduce part warpage or aid in part ejection / de-molding.

Hold time

Allow sufficient hold time to cool the part before removing it from the mold, preferably to about 130 F. Shortening the hold time can lead to increases in warpage, sinking marks, ejector pin scars and shrinkage.

Back Pressure

Using minimal back pressure, in the range of 50-100 psi (gauge) is conducive to improved cycle times. Higher back pressures may be used, however, if more screw shear for melting or pigment mixing is needed.

Mold release

Mold release agents are generally not necessary due to the excellent release characteristics of polypropylene. Sticking problems that cannot be resolved by modifications to processing conditions can sometimes be corrected by minor mold changes or by requesting an internally lubricated polypropylene grade. These changes are less expensive than many commercial aerosols that can contribute significantly to loss of decorating ability and high mold maintenance.

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