Science For A Better Life

Makrolon® TC8030 Processing Guidelines

Material

Makrolon TC8030 is a thermally conductive grade of Bayer polycarbonate designed primarily for heat sink-type applications, such as those used in LED replacement lamps. Compared to the most common material used in these types of applications, Makrolon TC8030 offers better corrosion resistance plus weight savings. In addition to greater design freedom, Makrolon TC8030 also tends to be more cost-effective, primarily through the use of part and assembly consolidation.

Wall Thickness

The part's wall thickness has the greatest effect on the flow length of Makrolon TC8030. Part geometry will dictate the wall thickness needed to ensure all areas of the mold fill at an acceptable pressure—0.060" is generally considered the minimum for the nominal wall. As part size increases, the nominal wall thickness will also need to increase. Studies have established that simply increasing the wall thickness from 0.060" to 0.080" results in an increase in flow length of 40%-60%, depending on processing conditions and material grade. To facilitate ejection and filling, a minimum thickness of 0.040" is generally recommended for secondary features.

Melt Temperature

Since the material cools relatively quickly, the recommended melt temperature is higher than other grades of Bayer Makrolon polycarbonate. As discussed earlier, part geometry, specifically wall thickness, is important, but melt temperature is also important. The hotter the plastic is as it enters the mold, the longer it will stay molten and continue to flow. In general, the melt temperature should be at least 600°F, with the recommended range being 600°F-660°F. Figure 1 to the right compares the flow length data generated during the study.

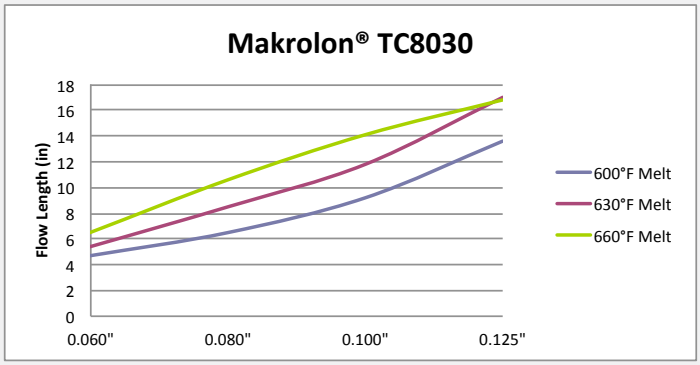

Figure 1. Makrolon TC8030 Flow Length

Mold Temperature

Mold temperature has very little effect on increasing the flow length of the materials. However, varying the mold temperature on the stationary and moving halves of the mold (lower on stationary half) tends to facilitate parts to remain on the moving half of the tool, allowing the parts to be properly ejected. A very high mold temperature, such as that achieved with oil, results in slight delamination of the material, causing it to stick to the mold. For this reason, mold temperatures of 200°F or lower are recommended for Makrolon TC8030.

Screw Speed / Back Pressure

In general, back pressure of 800 – 1000 psi (plastic pressure) and a screw speed of 70 – 100 rpm are suitable for Makrolon TC8030. Because the material cools so quickly, screw recovery may limit the cycle time. Care should be taken not to use too low of a back pressure to maintain cycle time or not enough shear heating may occur. Back pressure and screw speed has little effect on the thermal conductivity of the final part.

Residence Time

The material should not be allowed to sit in the barrel for an excessive amount of time (>30 minutes). A long exposure time may start to degrade the base resin, leaving material stuck to the flights of the screw and the check ring. If this happens, the screw may be unable to rotate and the nozzle may clog, resulting in downtime as the screw will need to be manually pulled from the machine and cleaned. Figure 2 illustrates what a screw, nozzle, and check ring look like after material was allowed to sit in the barrel for approximately one hour at elevated temperatures.

Figure 2. Check ring, nozzle tip, and screw

Regrind

Adding regrind to virgin resin should reduce the required pressure to fill, and also allow for lower processing temperatures without affecting the flow of the material. Studies have concluded that adding regrind (up to 20%) has little or no effect on the thermal conductive properties of the material.

Purging

The high viscosity and required melt temperatures of Makrolon TC8030 may loosen deposits of previously processed material. Following normal purging procedures, such as purging with a general-purpose polystyrene or commercial purging compound, is recommended. As long as the material is not exposed to high temperatures for an extended period of time (see Residence Time for time periods), these normal purging procedures should be adequate for Makrolon TC8030. If contamination problems persist, the screw and barrel may need to be cleaned manually.

Drying

The same equipment and procedures that are used to dry general Makrolon grades should also be used when drying Makrolon TC8030. The material should be dried to a 0.02% or less moisture content before molding. It is recommended to use a desiccant dehumidifying dryer with an inlet air temperature of 250°F and dew point of -20°F. Drying time should be approximately 4 hours. Makrolon TC8030 may produce more dust and/or fines than general Makrolon resins. If this is the case, more frequent dryer maintenance may need to be performed, such as cleaning or changing of filters.

Bayer MaterialScience