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PLASTIC INJECTION MOLDING
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MOLD SHRINKAGE

TECHNICAL ARTICLES | PROPERTIES OF PLASTICS

The previous two articles have discussed mold shrinkage and the factors involved in understanding shrink effects.

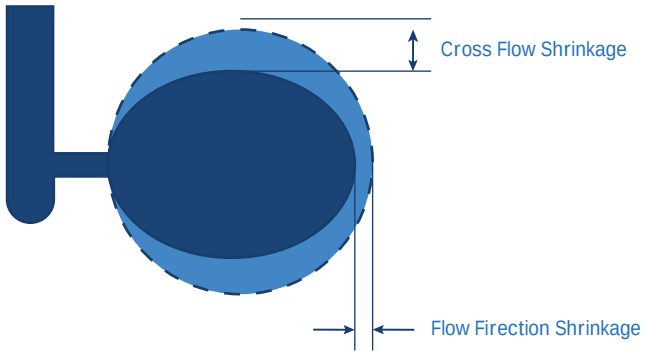
Despite best efforts, mold shrinkage will occur with a plastic molded part and part dimensions will likely be out of tolerance after it has shrunk. At this point, a tooling modification should be considered. Yet, how does one determine the appropriate adjustment?

To precisely determine how to adjust the tool, one must determine the amount of shrink that occurs at the current tool steel dimensions. The corrected relationship is defined by[2]:

Steel Dimension = (Part Dimension) / (1 ñ Shrinkage Value)

Problem: Determine the proper tooling change to create a part with acceptable as-molded dimensions:

Schematic:



Part after shrinkage showing highly exagerated effects of anisotropy.

Given:

OD across the parting line = 0.794 inches
Steel dimension = 0.8122

OD along the parting line = 0.7975 inches
Steel dimension = 0.811

Desired OD(min) = 0.799

Solution:

In this case, the desired OD is a minimum.
Thus, we will examine the smaller dimension in order to obtain our desired tool steel change.

Solving the above equation for ìshrinkage valueî, we have:

Shrinkage Value = 1 - (Part Dimension) / (Steel Dimension)
Shrinkage Value = 1 - (0.794 / 0.8122) = 0.0224 inch / inch

Now, solve the same equation for ìSteel Dimensionî using this obtained value for ìShrinkage Valueî:

Steel Dimension = (Part Dimension) / (1 ñ Shrinkage Value)
Steel Dimension = 0.799 / (1 - 0.0224)
Steel Dimension = 0.817 inches

Determine the change in the tool steel required:

Change in Steel = 0.817 ñ 0.8122 = 0.005 inches

Answer:

Change the tool steel 0.005 inches

This procedure was followed in practice and the final dimensions were within the calculated tolerance.

[1] Campo, E. Alfredo, The Complete Part Design Handbook, Hanser, 2006.
[2] Strong, A. Brent, Plastics: Materials and Processing, Prentice Hall, 2000.

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