Stop Punching Your Molds in the Face

A Quick Review on Setting Tonnage

By Shane Vandekerkhof, Consultant/Trainer

An issue that I commonly and continually see at customers is running a mold in a machine with inappropriate tonnage. There are a slew of issues that can occur if this problem continues.

First, we need to remember that when you clamp up a tool that the cavities are full of air, and we need to let that air out. To do this, toolmakers install a small channel in the parting line to let the air escape. This is called a vent. Its depth depends on the material being molded but is in the arena of .001". Because these vents are not very deep we need to be careful not to pinch them shut with too much tonnage. If we apply more tonnage than needed, then this air will be trapped and we get a defect known as a burn. This burn is caused by the compression of air at the flow front. As the air compresses, it heats up to the point where the material starts to scorch. Of course, you could always use duct tape, shipping labels and other items put between the parting line to get the mold to vent. I also fully expect you to know that I was being sarcastic with that last statement. NEVER do anything like that.

Second, when you shut off the vents with too much tonnage, you additionally increase the pressure it takes to fill the mold. Quite simply, any time you increase the amount of pressure it takes to fill a mold and drive plastic to the end of the cavity, you are increasing the variability of your process. We typically refer to this as pressure loss. I look at pressure loss as playing darts. The higher the pressure loss is, the farther you step away from the dartboard. We have enough things working against us in the process. Why add more to problem? By keeping the tonnage to an appropriate level we minimize the pressure loss in the tool.

Third, another long-term problem with using too much tonnage is the wear and tear on the mold. Let's face it, molds wear out over time, so why would someone want to accelerate that by running a mold with excess tonnage? The mold tonnage will continually press on the parting line, wearing it out pre-maturely. I have seen molds so worn out that when the tonnage was reduced to normal level, the mold flashed. It was simply beat into submission for years.

Lastly, let's explore how to set the tonnage correctly. The first thing we need to do is calculate the projected area of the parts and runner as seen at the parting line. This is the area where plastic projects itself on the cavity and attempts to force the mold open. Once the area has been calculated we need to apply a tonnage factor. Tonnage factors are commonly called out in processing guides of 3-5 tons/in^2 of projected area. We typically teach that 3 tons/in^2 is a safe number to use. The tonnage factor will typically depend on the thickness of the part. Generally speaking, a thinner walled part will need more tonnage than a thicker part.

Applying the correct tonnage to a mold will save you from part defects, increased process variation and wear and tear on the mold. A win, win, win by any measure.

Shane Vandekerkhof is an RJG Consultant/Trainer. Shane is a certified Master Molder^{SM} that is qualified to teach Scientific and DECOUPLED MOLDING^{SM} methodologies and techniques. He also has extensive field experience networking RJG's *eDART* System and implementing cavity pressure sensor technology. In addition to being pretty darn smart, he loves sushi, long walks on the beach, and holds the Guinness World Record for the longest non-stop Macarena dance.