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Gas Assist
Case Study 322-6

Automotive Side Trim Molding

Excerpted from “Gas Assist Injection Molding”, by Paul Dier and Rick Goralski

Automotive Side Trim Molding

In this case study, we will examine the process in which we applied gas assist to an automotive body side trim molding. The quality requirements for this part were extremely high. The show surface had to be perfect, and the part had to lay flat on the door. As this part was quite long with a very thin wall, warpage was a concern. **(See Fig. 322-6A)** Our goal was to eliminate warpage and still produce a high quality surface finish by applying gas assist.

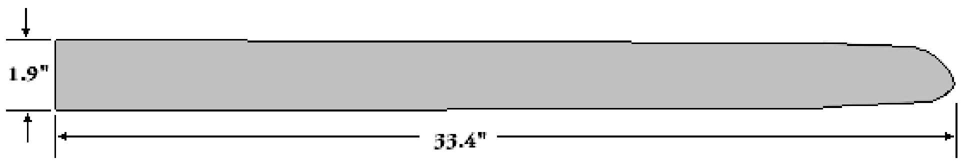

Fig. 322-6A

FIGURE 322-6A Warpage of this very long, thin-wall automotive side-trim part was of special concern, and quality requirements were high.

The mold was to produce one RH and one LH part. The resin choice was TO. We chose a cold sprue and runner to feed a single gate at the end of each part. Perfect balancing of the two cavities was critical, if we were to expect good results. A single gas channel was added down the length of the part. This channel was cut as a flat, rather than a half round. Due to the mounting of the part to the flat surface, we could not use the preferred half round gas channel. **(See Fig. 322-6B)**

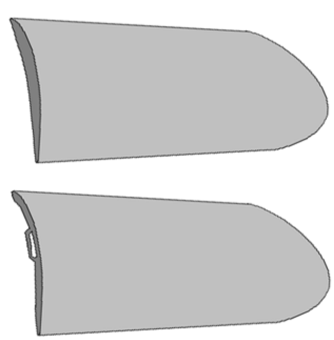

Fig. 322-6B

FIGURE 322-6B Mounting to a flat surface prohibited the use of the preferred half-round gas channel.

We chose to use gas pins in the mold rather than nozzle injection for this application. The reason for this choice was that it would be easier to maintain the high surface quality requirements by injecting gas just before the resin shot was completed. This would keep the resin moving in the cavity and eliminate the possibility of a hesitation line. Self venting gas pins were fitted to the cavity of the mold. This would allow for easy removal of the pins for cleaning, without having disassembling the mold. Holes were drilled in the mold plate to act as a manifold, so a single gas line could feed both gas pins. As the two cavities were symmetrical, we did not see the need for controlling each cavity with a separate gas profile. The pins were positioned on the core side of the mold, at the gate end of the part. **(See Fig. 322-6C)**

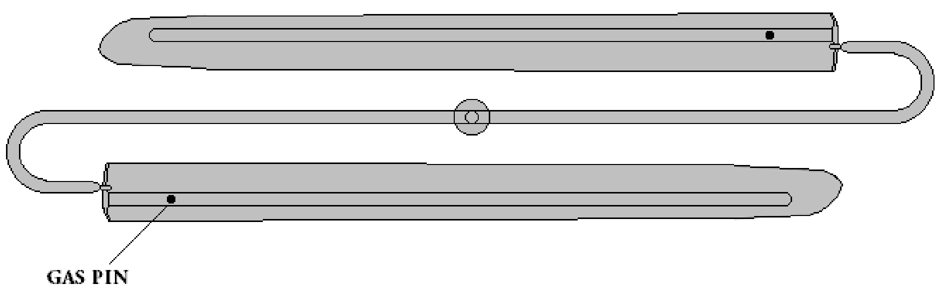

Fig. 322-6C

FIGURE 322-6C The two cavities were symmetrical, so a single gas line fed both gas pins positioned on the core side of the mold at the gate end of the part.

We believed that spillovers would not be necessary if we could precisely control the timing of the gas delivery. The gas would need to be injected just prior to the end of resin injection to avoid hesitation lines.

The finished mold was set in their 610 ton injection molding machine. The gas control unit was interfaced with the start of gas signal set at 1 inch before bottom. We took a few shots to establish the correct resin dose. We started injection gas when the part was approximately 85% full. Our first shots did not contain the gas, so we added material to the shot in small increments until the gas held. Our initial gas profile was set as follows:

Gas Delay Timer	0.05 seconds
Injection First Stage	2.5 seconds at 1200 psi.
Injection Second Stage	8.5 seconds at 900 psi.

Ramping, or the ability to control the rate of pressure rise, was a standard feature of our gas control system. As it turned out, this feature was critical to our success. After successfully eliminating the hesitation lines by using the gas delay timer, we found that the gloss level changed where the gas completed the fill. We also had some gas permeation into the thin wall sections of the part. By adjusting the ramp settings, in conjuncture with the delay timer, we were able to produce the high quality surface that was required.

The first stage gas pressure was ramped up from zero to 1000 psi at a rate of 500 psi per second. This allowed for a smoother filling of the cavity when the gas took over. As we eliminated the gloss and permeation problems, we found that the hesitation lines reappeared. The delay time was lowered to compensate for the slower gas fill. After much experimentation, we were able to consistently produce good quality parts with the following gas profile.

Gas Delay Timer	0.3 seconds
Injection First Stage	2.5 seconds at 1000 psi.
Ramp Second Stage	500 psi per second
Injection Second Stage	8.5 seconds at 700 psi.
Ramp	500 psi per second

It should be noted that if the resin injection fill speed was changed, the gas delay time and the ramp settings had to be changed as well. Each of these parameters affected the other. We were successful with this project, due to the fact, we had available the precise control necessary from the injection molding machine, as well as the gas control unit. Consistency of injection fill time, and shot weight, both had to be monitored for continued success. We also found that by increasing the surface temperature of the mold from 70 degrees F., to 90 degrees F., helped open up our process window considerably.

When we completed the trial, our final overall cycle time was 50 seconds.

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