Gas Assist
Case Study 322-7

Scan Head Holder

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

Scan Head Holder

Industry: Medical

Material: Structural Foam converted to ABS

Objective: To convert a structural foam part to an engineering grade of resin utilizing the gas assist process, with no tool modifications.

The structural foam product is a scan head holder for an ultrasound medical cart. The part was designed with the typical structural foam dimensions for low pressure fill. The nominal wall thickness is between 4 mm and 19 mm, depending on the area of the part and its configuration. **(See Fig. 322-7A)**

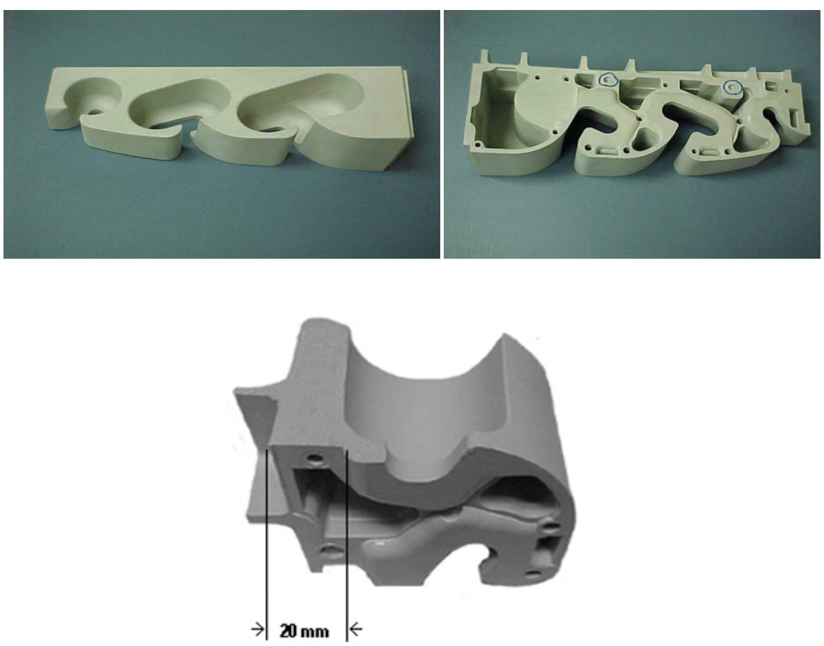

FIGURE 322-7A The objective with this structural foam scan-head holder with a nominal wall thickness between 4 mm and 19 mm was to convert to an engineering grade of resin utilizing gas assist with no tool modifications.

The customer wanted to achieve the results associated with gas assist technology. The list of desired benefits from the conversion process was as follows:

1. To achieve a reduction in part weight.
2. To achieve a smooth surface that would no longer require a three coat paint process.
3. To reduce the overall cycle time of the product.
4. To achieve the same part integrity as the structural foam predecessor.
5. To have a minimal tooling modification cost.

With these goals in mind, our design department evaluated the part, and the part was accepted as a successful candidate for gas assist in its current configuration. There were to be no tooling modifications, and the part was to be tested as is.

We calculated a cycle time savings of 25%, and a weight reduction of 30%. We also concurred that a fog coat of paint would be the only necessary secondary step required, eliminating any sanding operations that are associated with structural foam molding. We advised the customer that the large edge gate currently on the part would leave a void on the part, due to gas penetrating through the runner. We were then advised that this was an acceptable area to have a void occur, due to its mating with other products during assembly.

The trial was performed on a 700 ton press. The only modifications to the molding machine were a mechanical shut off nozzle, and a limit switch mounted at the injection forward position. This switch, when activated, would initialize the gas injection process profile that was entered into our Bauer controller. The gas assist set up took less than an hour in its entirety. We were then ready to attempt the first shot.

Almost all settings from the parts' normal setup sheet were utilized; except for the shot size parameter, the pack, hold, and cooling times. Other changes were a different barrel temperature profile, to accommodate the new resin, and turning on the machines' sprue break option.

We started the tryout by taking a series of short shots, evaluating each for containment of gas. We also examined the sprue break travel, so that it would occur at the correct sequence of the cycle. At the end of the injection stroke of the molding machine, we triggered the limit switch, which sent a signal to the Bauer controller. This signal initialized gas injection to occur, according to our programmed set points.

Gas Delay Timer	0 seconds
Injection First Stage	1.5 seconds at 1500 psi.
Ramped	1.0 seconds at 1000 psi.
Injection Second Stage	3.0 seconds at 2500 psi.

The gas was held within the part for the remainder of the cycle. Then the gas was vented to atmosphere, using the sprue break function of the molding machine, just prior to mold opening.

We experienced a series of successive blow outs, while we zeroed in on the correct dosage of plastic resin. Once we established gas containment, we ran another series of parts to demonstrate the consistency of the process.

With gas containment and shot to shot consistency evident, we then tried modifying the parameters to optimize our set points. These modifications included reduction of resin dosage, and elimination of unnecessary cycle time. We then established the optimal set points and ran a series of shots for dimensional and capability studies.

The finished product displayed excellent gas core out with far superior surface finish. **(See Fig. 322-7B)**

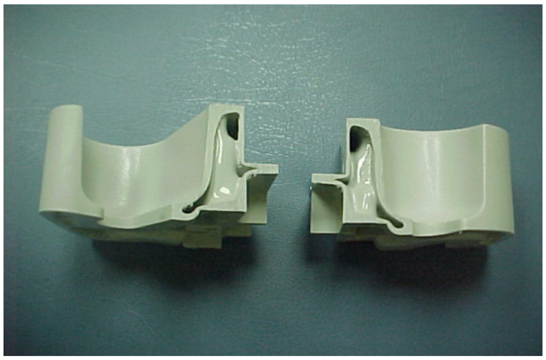

FIGURE 322-7B The finished product displayed excellent gas core-out with superior surface finish, and no tooling modifications were necessary.

The results of the trial indicated the following:

1. A 54% reduction in part weight.
2. An improvement in cycle time by 60 seconds. In its structural foam configuration, the cycle time was 180 seconds. We were at 120 seconds, a 34% improvement.
3. Aesthetically, the part was smooth and free of defect except for visible flow lines caused by part configuration. It was agreed that only a fog coat of paint would be necessary to achieve a similar part surface and color match to that of the structural foam product.
4. The product was found to promote more structural integrity through the most dependent feature, due to gas passage through its wall. The part was free of sink, even in its near 20 mm wall sections.
5. Absolutely no tooling modifications were necessary to promote the use of gas assist with this product.

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