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Shop Solutions

Porous Aluminum Pays Big Dividends for Thermoformer

Incorporated in March 1995, Atek Thermoforming Inc. (Belleville, MI) has a problem many businesses would like to have: trying to handle annual growth rates of 200-300%. In fact, says owner and president Kurtis Nofz, "this year (2001-2002) has the potential to grow 500% or more."

Atek thermoforms Class-A automotive exterior parts, in-mold decorative appliqués for automotive interior components, and dunnage (pallets and trays) for transmission and other automotive parts on in-line, shuttle, and rotary thermoforming equipment. The company also operates a Reis 300-watt CO_2 laser for trimming and other applications, and a Haas VF6 CNC machining center for moldmaking and three-axis patterns, although much of Atek's pattern work is subbed out due to the workload, according to Nofz.

To avoid becoming a victim of its own success, Atek aggressively attacks every opportunity to save time and improve part quality. One such opportunity Nofz began evaluating almost two years ago was using porous aluminum, tradenamed Metapor, for thermoform molds.

In thermoforming door spears (long and narrow plastic panels for interior door decoration), for example, the 0.020" (0.51-mm) film is drawn down via vacuum onto a highly polished aluminum mold and heated. "A particular problem we had with door spears was that air entrapment would cause the film to puddle on the surface, which would cause orange peel, waves, and other appearance problems," Nofz explains. To use standard aluminum molds for the job, Atek had to carefully place and drill vacuum holes to evacuate the air. Switching to the porous aluminum material would mean the firm could forego drilling of vacuum holes, an immediate time savings and potential quality improvement for the resulting parts.

Rather than jump right in and try out the mold material on a visible car part, Nofz first decided to use Metapor for thermoforming a dunnage tray for shipping precision transmission components. Although it wasn't a Class-A part, the job was a high-volume application for Atek and would function as a good first evaluation of the new mold material.

The company realized an immediate benefit when it started machining the material. "It cuts more like wood than aluminum," according to Nofz. Overall machining time was cut in half compared to similar-sized standard aluminum molds, and finish cuts were made 70% faster. "Not only can we take heavier rough cuts and use faster spindle speeds and feed rates, we get a better tool finish," he says. Benching a standard aluminum tool required rough and finish grinding. The porous Metapor required no grinding or polishing, simply light sanding.

And, as previously mentioned, the Metapor material required no drilling for vacuum holes. "When we build up a standard tool, we need to build in a vacuum box to draw the vacuum from," Nofz explains. A similar Metapor tool just needs a simple hole for attaching the mold to the mold base for cooling.

In vacuum thermoforming-in essence, sucking a flat plastic sheet down onto a highly polished tool-the plastic constantly tries to pull away from the tool. Using standard aluminum with vacuum holes means drawing down to the holes, and if a leak develops, pressure drops along with part quality.

Instead of drawing down to the vacuum holes, a Metapor tool allows drawing down over the entire tool surface. This improves part uniformity and results in fewer distortions compared to standard aluminum thermoform tools. Nofz says his company has even provided a grain surface on a Metapor tool, so the grain shows with uniformity in the part.

In toolmaking, however, time savings are realized only once, as the tool is made. How did the first dunnage-tray tool fare in performance? After more than 18 months in service and close to two million cycles, the tool is still performing, according to Nofz. "We just rough machined and sanded it," he says. "The thermoforming [the tray is made of ABS] has polished it. In theory, the tool could last forever."

About the only shortcoming Nofz sees with Metapor is that the maximum workpiece size he can obtain is 500 X 500 X 400 mm, and his company does larger-part applications that could potentially benefit from the material's advantages. "We can splice blocks together with epoxy and machine them, but what's happened is the epoxy doesn't have the same thermal conductivity as the Metapor material, so you'd see the line in the part. This is OK for some of our dunnage applications, but no good for visible automotive parts."

In spite of managing his growth concerns ("more people, more capital, more room" are the needs), Nofz is a solid convert to porous aluminum tooling. "We're applying it to as many projects as we can," he says. "If we could make everything off it, we would."