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INJECTION Molding

FOR INJECTION MOLDING PROFESSIONALS

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Hot running parts to China

Molding acetal can be tough, and with a hot runner system it can be even tougher. One Connecticut molder figured out how to do it right thanks to some nifty hot runner noodling.

A custom molder in Connecticut has been successfully selling small, ultrahigh-precision acetal parts to China for more than five years now thanks to its expert use of an extraordinary valve gating system that has no moving parts. Orders have more recently been placed for two even more taxing acetal parts that it will run in the same extraordinary mold. These parts also are China-bound.

The original parts are bearings for business machines run in Delrin 500 acetal for a major global manufacturer of office equipment. Part concentricity has to be maintained to within ±.03 mm or better in three different places. The eight-cavity, stainless steel mold has 32 drops. The molder is Phillips-Moldex Co. (PMC), a division of C. Cowles & Co. (New Haven, CT). The hot runner system is from Thermal Valve Gating Inc.

Thermal valve gating (TVG) technology uses probes with two heaters—a body heater and a patented, independent probe tip heater right in the center of the gate that cycles on and off in tandem with the molding cycle, melting the gate open before each shot and allowing it to cool after pack.

There's no stringing, drooling, or unwanted gate freeze-off with TVG. Improved gate vestige is another reported plus. And unlike mechanical valve gating systems, TVG systems require no maintenance because there are no moving parts to maintain.

Other TVG advantages:

- A wider processing window.
- First shot startups.
- Faster cycles and color changes.
- Less molded-in stress.
- Less core deflection.
- Zero material degradation.
- Zero gate blemish.
- Zero downtime.

Possible Impossibilities

"We accomplished something nobody thought we could do by running small, high-precision acetal parts in multigate tooling with no plateout," says Keld Rasmussen, PMC's VP of engineering.

"I've known Ed Potter, the president of Thermal Valve Gating, for a long time. I know that if Ed says he can do it, he can. We went to him because of the demanding nature of these parts. They would require small probes only 19 mm across from one another. We couldn't use standard, nonmechanical multitip systems because there's no guarantee all 32 tips will open when you start injecting."

Rasmussen explains that because of acetal's crystalline nature, "it's either frozen or liquid. I only knew of one guy who could deliver the kind of system we needed and we challenged Ed. He said he could deliver and he did."

Equipped with and controlled by a hot runner system from Thermal Valve Gating, Phillips-Moldex runs millions of precision acetal parts in this cell. The parts are sold into China.

To run new acetal parts filled with Teflon and carbon, PMC only needs to change the B side of the mold running the original white acetal parts.

We asked Ed Potter about this job. Here's what he had to say:

"Although we can make probes down to ⅛-inch diameter, we always try to use standard products. We did this by tipping the probes on 5° angles, allowing us to drop the feeder to the gates down the center of all four probes."

Beating the Spec

"The reason we are so successful with engineering grades and temperature-sensitive materials like acetal is that we don't add any heat to the material," Potter continues. "The material enters the manifold at a higher temperature than the manifold. We do not have to overheat the body of the probe to open the gate. We have a tip heater to do that."

Potter delivered all of the hardware—the hot half and all of the wiring—and the controller. The system, built in 1999, cost about $120,000, including the controller. PMC ran 11 million pieces on it in 2000.

"All we had to do was bolt the A plate on. We had about a six-month learning curve to get it right, but we only had to pull it for basic mold maintenance after that first year. We've run over 30 million parts since then.

"The gates are .030 inch," he continues. "Although the specification called for us to hold concentricity to within ±.03 mm, we actually hold concentricity to within ±.02 mm at a 1.67 Cpk and 2.0 Cp."

PMC's Keld Rasmussen (r) and Robert H. Gaura, CFO of C. Cowles & Co., PMC's parent company, discuss the importance of tool design in competitive precision molding.

The parts are run at PMC on a 110-ton Cincinnati-Fanuc Roboshot all-electric, a brand-new press purchased specifically for this job.

"No other mold has ever been in this machine. It's a good machine, yes, but it all starts with a good mold," says Timothy J. Barry, PMC's manufacturing VP.

Selling to China

After being told the part soon would no longer be needed, Rasmussen asked his customer if it had any other parts for the mold. The customer said it had two newer parts with dimensions that would fit the tool and placed the order. The new parts also are in acetal—a proprietary RTP acetal compound filled with Teflon and carbon, that is.

"The molds are just now coming in," he says. "All we'll have to do is change the B side of the mold. Meanwhile, our customer has told us that it will still need us to produce the original acetal part for a couple of more years. We are shipping millions of parts to China, and soon will be shipping millions more."

"We have the capability," Barry says. "They may have the cheap labor, but they haven't mastered the art of precision molding. And freight costs? Well. A boat dead-heading back to China is empty, so our customer's freight costs are next to nothing. These are small precision parts. You can fit thousands of pieces in a box."

Rasmussen adds, "Also, our customer can't afford to release this type of precision molding technology to China, because of the price of all the trips that would be required, and degree of engineering involved. There's also the issue of intellectual-property—of security. Our customer's assembly plant in China is run by a subcontractor who also molds parts. It's been told by our customer to buy these parts only from PMC. Though our ultimate customer is 'global,' we're selling these parts directly to a Chinese company."—*Carl Kirkland*

More about PMC

Phillips-Moldex Co. (PMC) occupies a 40,000-sq-ft plant in Putnam, CT. A QS–9000-certified, privately held company owned by C. Cowles & Co., about 40% of its business is for office equipment, 35% is automotive, and the rest is for a variety of other markets.

It has about 250 active molds and 32 molding machines, ranging from 20 to 250 tons. Seven of its presses are all-electric Cincinnati Milacron-Fanuc Robotshots. The rest are hydraulics from Nissei and Arburg. It plans to replace all of its hydraulic presses with all-electrics.

Though PMC employs 24 people working six days/week, there are only two machine operators per shift on the floor for its 32 machines. PMC is a highly automated, lean manufacturing company. It plans to weed out all of its secondaries to save on labor costs.

PMC's Keld Rassmussen says that PMC sells millions of other parts to China in addition to the acetal parts molded in the TVG-equipped mold mentioned above, "the reason being that, due to automation and tool design, we can actually produce these parts for less here than the Chinese can over there."

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