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Cycletime Tips - General

Volume 25: Gas Assisted Injection Molding

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Gas assisted injection molding is becoming more popular in the injection molding industry due to more complex and thicker parts. Gas assisted injection molding (GAIM) was originally developed to overcome the shortcomings of structural foam technology in thick walled parts. Since the acceptance of the GAIM technology, far more advantages have been identified and are being utilized.

The GAIM process is a process that introduces a pressurized inert gas (nitrogen) into the melt stream of a part. There are two different methods to introduce gas into the system. First, the gas could be introduced immediately as the part is filled. The pressurized gas will then be used to pack the part from the inside. As the part is cooling, the voids that form in the center of thick walls or at the intersection of ribs and bosses, will be packed by the inert gas. The gas will push the material to the surface of the tool and keep these areas from sinking and yield a good surface appearance.

The second method is to short shot the part with the plastic material, then at the instance the material stops flowing, start the flow of pressurized air. The air will follow the path of least resistance which is almost always the center of the wall section. The air will continue to force the plastic material at the center of the wall forward, and continue to fill the part. Because plastic flows from the inside out (fountain flow), the gas will not break through the melt unless there is insufficient material to fill the mold. The gas is then used to pack the part. The result is a hollow part. This process is used for some thick walled parts that cannot be cored out from the outside, such as refrigerator handles.

The gas can be introduced into the process two different ways: through the nozzle or into the part. Introducing the gas through the nozzle allows the process to be utilized on existing tooling without altering the tool. Introducing the gas into the part gives the designer more flexibility by allowing the gas to be introduced into the area most needed of the part. It also can allow for more than one gas injection point.

The original intention of the GAIM process was to be able to mold thick walls without surface imperfections. This was accomplished but other advantages have also been realized. The cycle times were decreased dramatically due to the resulting thinner wall sections and the material being forced into constant contact with the mold walls. The parts can be molded with lower pressure because the part is not being completely filled or packed with plastic pressure and the gas nozzle is much closer to the end of fill, therefore the pressure needed is lower. This enables larger parts to be made on smaller machines. The minimum clamp tonnage required for conventional molding is 2 - 5 ton/in2. Using the GAIM process, required clamp tonnage is sometimes as low as 0.5 ton/in2. The lower

injection pressure also results in a part with much lower internal stress. This will enable parts to be molded with less warp. This is utilized in a lot of the television frames. These parts are molded using one gate and are kept flat using the GAIM process.

This technology is currently being licensed by several suppliers. The equipment and license are an added expense, and added training is required for both processors and designers. These added costs could be offset by reduced cycle times, higher quality parts, and material savings.