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Reducing cycle time by LaserCUSING

KORTRIJK, BELGIUM — Vlaams Plastics Centre, a service company based here, employs a team of experts from the plastics sector, each having 30 years of experience in his or her specialist field. The main aim of the Centre is to gather knowledge in the field of plastics processing and to use this knowledge to provide information and advice to plastics-processing companies.

Plastic injection molding is a highly competitive business and mold tool design influences not only quality and cycle times but ultimately production output and profit. One area of the injection molding process that has a significant impact on the overall cycle is the time required for cooling, prior to the finished component being ejected from the mold tool. It is clear, therefore, that finding ways to reduce the cooling cycle, while maintaining or even improving product quality, is a prime target for mold tool designers.

The use of LaserCUSING® technology, a process from the field of rapid tooling / prototyping / manufacturing, offers tool and mold makers the option of producing mold inserts with individually configured close-contour cooling channels in the space of just a few days.

The close-contour cooling may consist, for example, of an individual cooling channel (FIGURE 1), of many individual loops, which in a parallel connection open into large access and outflow bores (FIGURE 2) or of a cooling surface with a mesh structure (FIGURE 3). The advantage of LaserCUSING is the individual design of the cooling channels that can be tailored for the specific component. The process enables cooling channels to be designed and created which run close to the contour or surface of the mold insert, providing much greater control of cooling and the ability to guarantee uniform temperature distribution during cooling.



FIGURE 1. The close-contour cooling of an individual cooling channel.

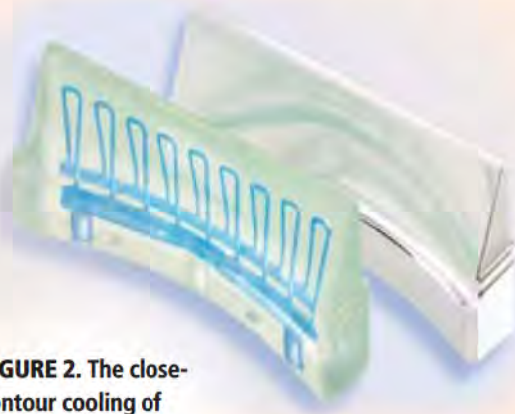


FIGURE 2. The close-contour cooling of many individual loops which in a parallel connection open into large access and outflow bores.

Conformal cooling

The specialists at Vlaams were already aware of LaserCUSING and the benefits that it can bring to the injection molding process through the creation of conformal cooling channels in mold tool inserts. However, according to Mr. van Hoye, head of the team of experts, it became apparent that it is difficult to convince mold tool manufacturers and plastics processors of the advantages without presenting a realistic demonstration of the capabilities of the process.

For the Vlaams Plastics Centre, this provided the impetus to carry out a study comparing the influence of four different mold tool inserts in the injection-molding of a plastic part.

This extensive study compared the cycle time required to achieve a targeted de-mold temperature using mold tool inserts produced in different materials by conventional machining methods, with a conformally cooled insert produced using the LaserCUSING process. These tests were also conducted using two different polymers, PP (polypropylene) and ASA (acrylic ester-styrene-acrylonitrile).

Additional objectives of this study centered around the amount of bending on the component following complete cooling and also the level of distortion

present within a “U-profile” in the part. The results of the study served to confirm the initial views of the experts at Vlaams Plastics Centre that the insert produced by LaserCUSING would bring significant benefits. The cycle time required to achieve the targeted de-mold temperature of 65 degrees was just 24 seconds with the LaserCUSING insert compared to 31 seconds with a conventional steel insert, a saving of 7.0 seconds or 20%. This result was consistent across the two different polymers tested.