glass WORLDWIDE

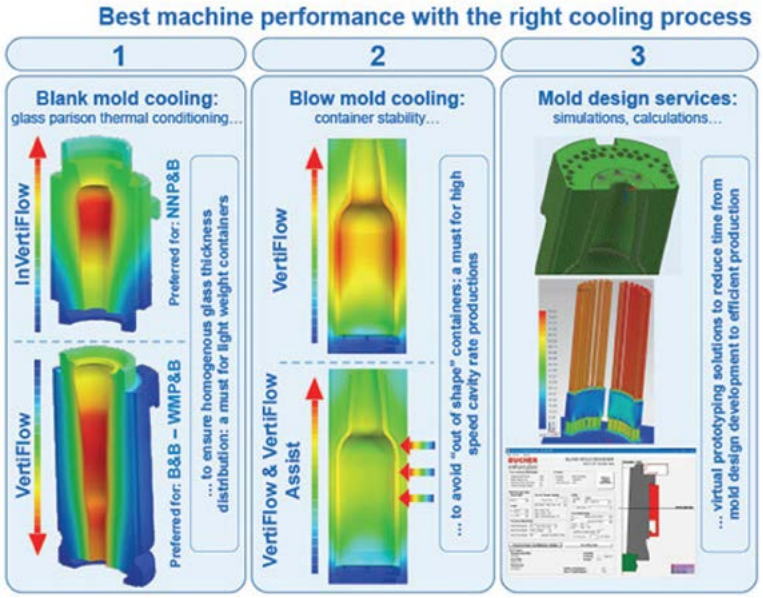
Mould design: Blank mould cooling options

In the second of a series of four articles, Dominique Vassaux considers the importance of mould cooling, its influence on the performance of the IS process and on container quality. He explains the different cooling needs depending on the type of production process.

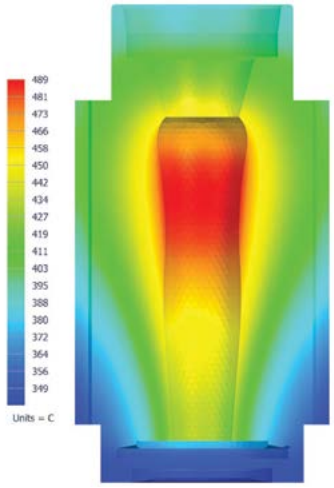
The blank side VertiFlow system directs cooling air from top to bottom of the blank mould, whereas the blank side InVertiFlow system directs cooling air in the opposite direction. As a result, the temperatures are much colder at the top of the blank mould when using blank side VertiFlow, whereas it is colder at the bottom when using InVertiFlow. Both systems are very flexible as the cooling air entry and exit positions can be defined without much constraint, giving the mould designer a direct influence on the vertical temperature distribution of the blank mould.

Cooling the blank mould by means of vertical holes provides increased cooling efficiency (compared to traditional radial stack cooling), as more heat can be extracted from the mould but also improved container glass thickness distribution since the cooling holes ensure an even horizontal temperature distribution and the correct vertical temperature gradient on the blank mould cavity. This second benefit is key when producing very lightweight containers.

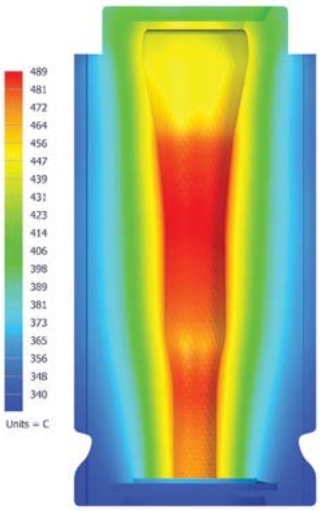
Obviously, the vertical blank mould temperature distribution must be tailored to suit the parison thermal conditioning requirements, which is mainly a function of the production process: ▸



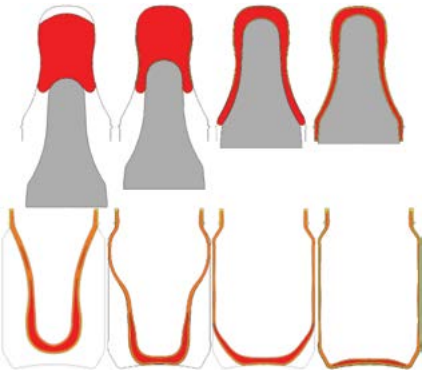
Cooling overview.



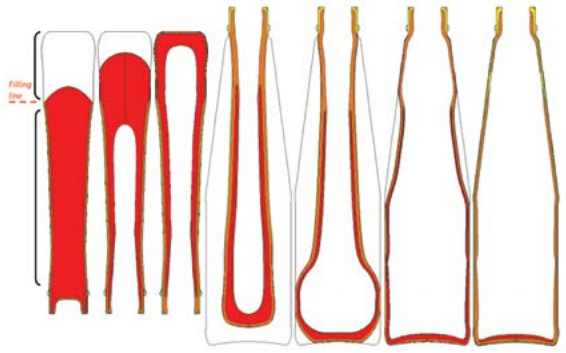
Blank side InVertiFlow ToC profile.



Blank side VertiFlow ToC profile.



Widemouh press-blow process.



Blow-blow process.

Narrow neck press-blow process.

- **Blow-blow (BB):** In order to counterbalance the mould/glass contact time difference 'below and above' the glass filling line and consequently, improve the settle wave mark on the final container, cooling must be focused at the top of the blank mould, in particular on the filling line region (where the glass stops inside the blank cavity). At the same time, less cooling is given on the neck and shoulder areas of the blank cavity, to ensure smooth forming behaviour of the shoulder at the blow side.
  Bucher Emhart Glass (BEG) recommends blank side VertiFlow for the BB process, as it makes the top of the blank mould much colder than the bottom.
- **Narrow neck press-blow (NNPB) process:** Most of the cooling air needs to be focused at the lower part of the blank mould cavity, in order to guarantee enough glass thickness in the neck and shoulder of the formed container, avoiding hollow necks and thin shoulders.
  BEG recommends blank side InVertiFlow for the NNPB process, as it maximises cooling at the bottom of the blank mould to maintain cold glass in the neck and shoulder of the parison.
- **Widemouth press-blow (WMPB):** Cooling air must be focused on the neck ring for jar productions to guarantee finish stability, avoiding dimensional defects on the finish.

BEG recommends blank side VertiFlow for WMPB jar production, as some VertiFlow cooling holes can be used to cool down the neckring in the blank mould closed position, allowing increased cooling capacity and temperature homogeneity at the neckring cavity.

In general, in case a glass plant produces a mix of containers with all production processes, BEG recommends blank side VertiFlow cooling, as it provides total flexibility from a clamping and cooling perspective. However, the mould designer must understand the importance of configured cooling holes design, in order to balance correctly the vertical temperature distribution to suit the need of the parison thermal conditioning for each production process. Therefore, training at BEG is key in order to achieve best cooling performance.

The third in this series of articles will be published in the November/December 2019 issue of Glass Worldwide.

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