

Technical News Bulletin

Steinhausen, June 2007



Diffuser exits increase the cooling capacity

- Opening up the top end of the bores the mass flow through the bores increases and with that the cooling capacity is improved.
- In field tests the diffuser exits gave a reduction in mold temperature of up to 20°C.
- Gain in cooling capacity can on the one hand be used to increase the production speed, if the blow mold cooling was the limiting factor.

Introduction

For some high speed productions or when running articles on Center distances that may not be ideal, the VertiFlow cooling on the blow side may be on its capacity limits. Through intensive research EG found an easy way to increase the cooling capacity. By simply opening up the top end of the bores the mass flow through the bores increases and with that the cooling capacity is improved. Figure 1 shows a sketch of this principle.

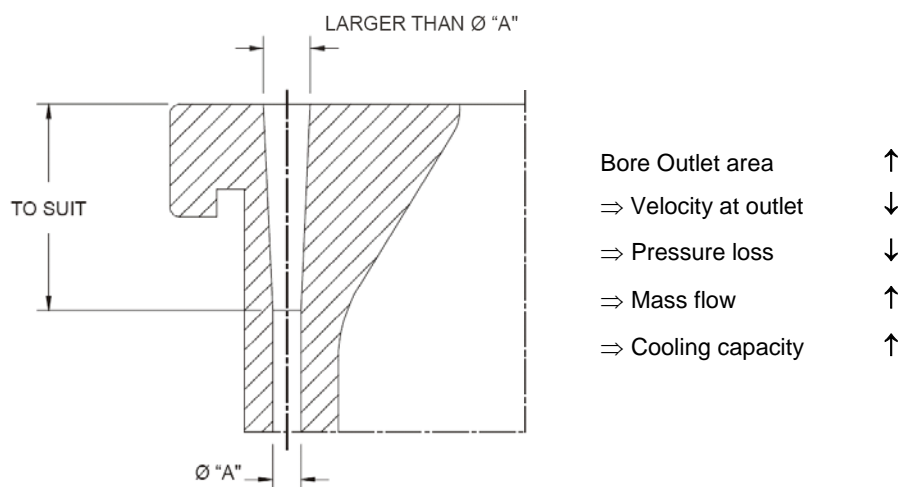


Figure 1 – Diffuser exit in mold

Laboratory measurements and field tests proved that the mass flow through the bores increased by 15-30% depending on the design of the diffuser exit. The higher mass flow in turn results in a 15-20% higher cooling capacity.

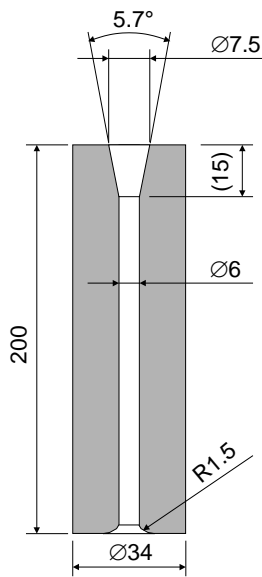
This gain in cooling capacity can on the one hand be used to increase the production speed, if the blow mold cooling was the limiting factor. In field tests the diffuser exits gave a reduction in mold temperature of up to 20°C. On the other hand the fan pressure can be reduced by 35-70% in order to save energy cost.

The diffuser exits can also be used to influence the horizontal temperature profile. For example if the mold close to the parting line runs too hot and no extra bore can be drilled, implementing diffuser exits at the bores closest to the parting line will equalize the temperature profile.

The use of diffuser exits is not limited to the blow side. They can be used on the blank if the new InVertiFlow cooling system is used. The same possibilities as discussed above for the blow side apply for the InVertiFlow on the blank side.

Implementation on the mold

The existing bores in the mold are tapered using a reamer. For most application tapering on a depth of 15-30mm at a reamer ratio of 1:100 up to 1:50 is a good start. For the laboratory tests the bores were opened up on a depth of 15mm from 6mm to 7.5 mm and to 9mm respectively. Due to the lower outlet velocity the bigger opening gave better results.



	No diffuser	Diffuser 1 6 ...7.5 mm	Diffuser 2 6 ...9 mm
Mass flow	100%	+ 16%	+ 28%
Cooling Capacity [%]	100%	+ 13%	+ 19%

Figure 2 – Diffuser exits tested in the laboratory and test results

In practice the limitation for opening up the bores is the neighboring bores. Therefore the most practical way is to choose a reamer and tapering the bores until they just slightly run into each like shown in Figure 3.



Figure 3 – Diffuser exits implemented on a mold

Limits

The diffuser exits will not give an extra cooling capacity if the fan characteristics cannot supply the additional air flow.