DDM4GLASS – Direct Digital Manufacturing for Glass

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SUMMARY

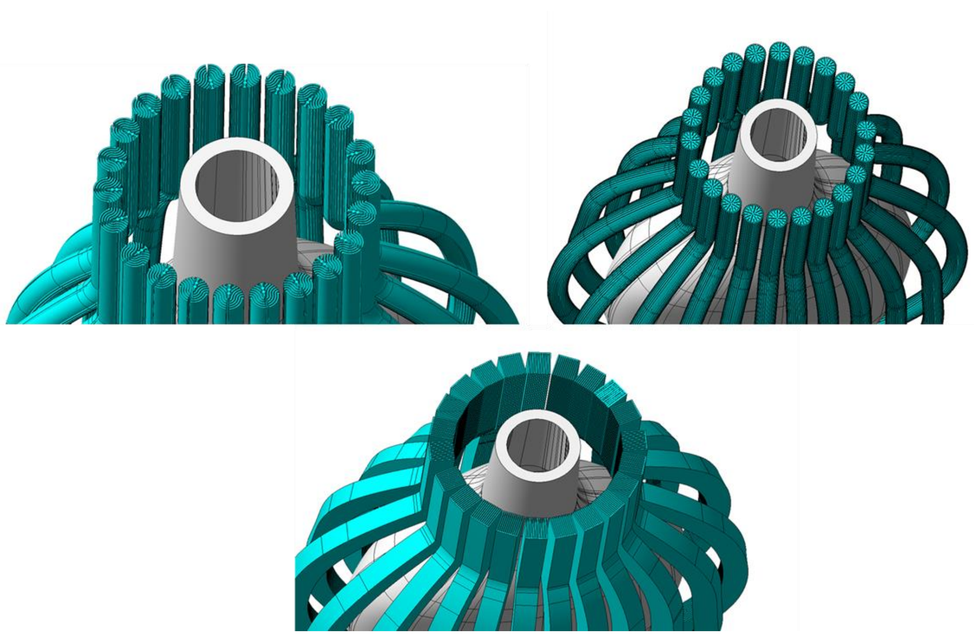
The main objective of the project is to develop strategies and methodologies for the design and manufacture of molds for glass through direct digital manufacturing solutions. To this end, additive and hybrid manufacturing solutions will be tested in order to take advantage of each solution and fill gaps in both processes. With the execution of the project, the consortium expects the development of molds for the glass industry whose productivity capacity, that is, a production rate and adjacent quality, is optimized.

INTRODUCTION

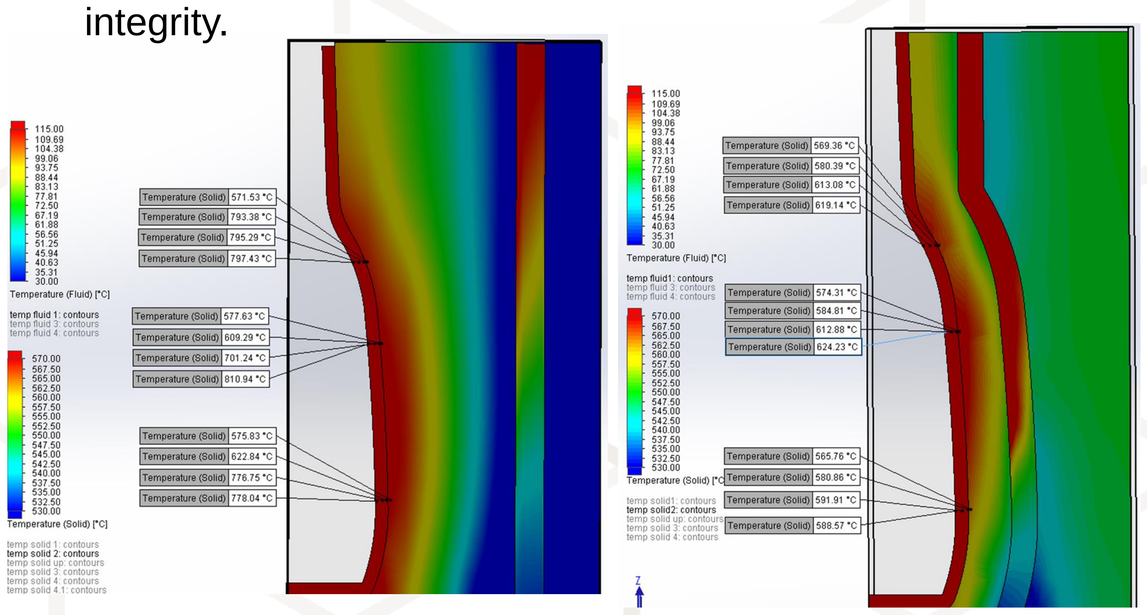
Within the scope of the DDM4Glass project, it is intended to develop optimized cooling solutions for glass molds, thus using additive and hybrid manufacturing solutions. The additive fabrication and the hybrid fabrication bring the possibility of developing conformable channels, capable of accompanying the molding zone and consequently obtaining thermal gradients more suitable for the glass molding process [1]. To develop these solutions, computer simulation work will be carried out in order to obtain a study of the channel geometries that best suit the cooling process, as well as equipment that will allow the local testing and recording of the physical processes involved. This poster intends to present some of the simulation work carried out, as well as solutions for the development of the test equipment.

DEVELOPMENT

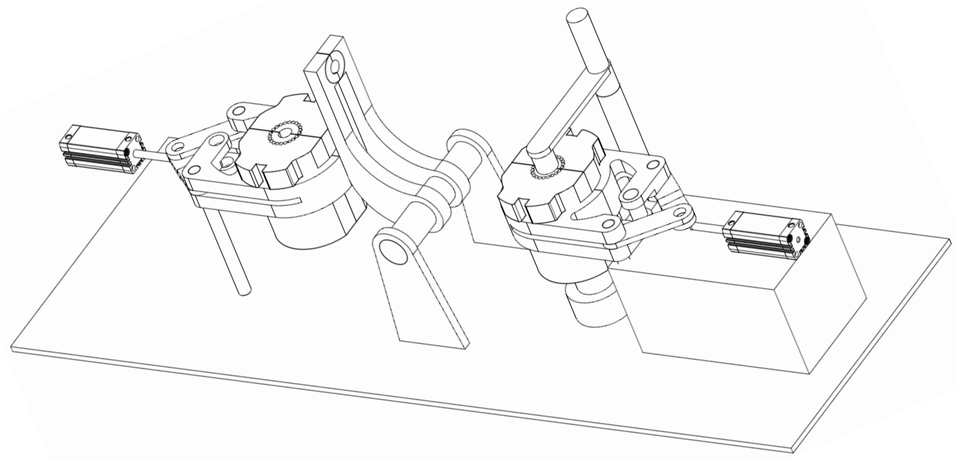
Alternative cooling channels were designed, with and without fin configurations to improve surface area. These alternatives are to be simulated and tested to analyze the gains of each configuration.



The CFD (computer fluid dynamics) simulations shows it is possible to increase cooling efficiency off the mould. Since the cooling channels are not axial it is possible to identify mould volumes that don't interfere in cooling of the mould, so these material volumes can be replaced by lattice geometries, reducing weight, production times and maintaining structural integrity.



In order to test the developed moulds, it is necessary to develop a testing equipment. Since the field testing is almost out of question, the design of an equipment with the same workflow and movements as the industrial manufacturing sections is under development.
This equipment is a laboratory version of the industrial machines and allows to manufacture the final product, allowing mould exchanges and data acquisition to evaluate performance of the different alternatives presented.



CONCLUSIONS

This R&D project is pioneering conformal cooling channel design for glass moulding. The success on optimizing the glass cooling and mould temperature control unblocks opportunities to manufacture complex bottle designs in large series. The project promotes product differentiation and increased value for packaging and moulds.

REFERENCES:

[1] M. Soshi, J. Ring, C. Young, Y. Oda, and M. Mori, "Innovative grid molding and cooling using an additive and subtractive hybrid CNC machine tool," CIRP Ann. - Manuf. Technol., vol. 66, no. 1, pp. 401–404, Jan. 2017.

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