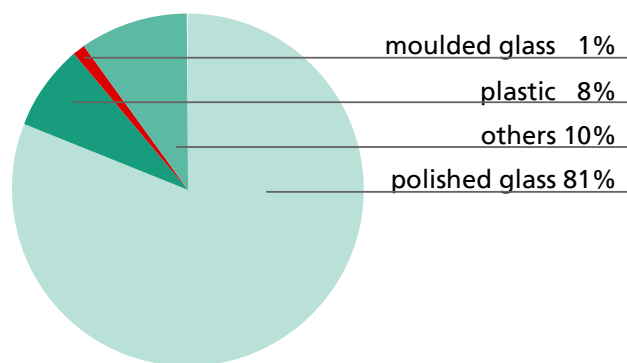


Survey among optics manufacturers shows excellent perspectives for precision glass moulding

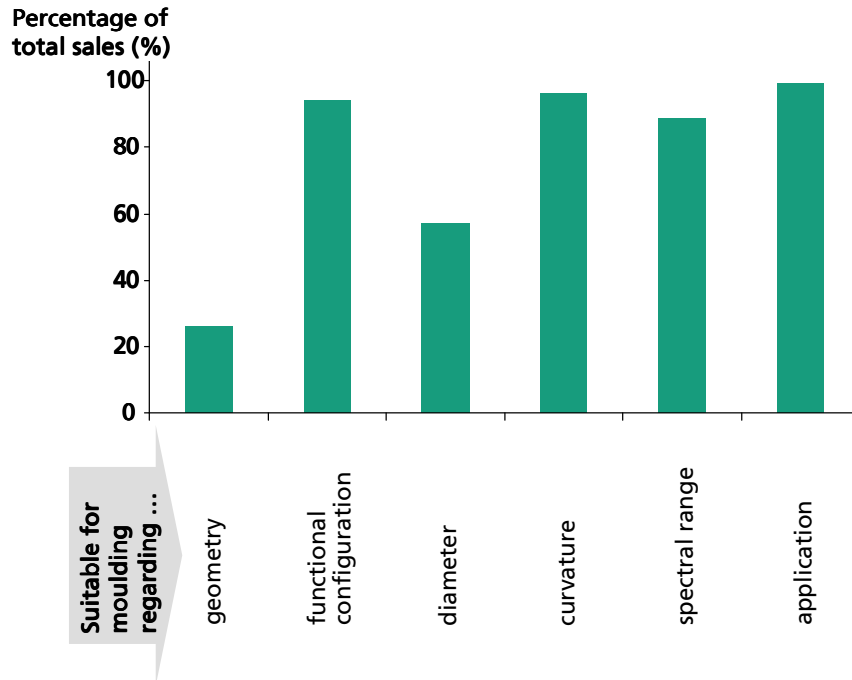
Recently, Spectaris and the Fraunhofer Institute for Production Technology IPT have studied the German market for optics with a survey. The goal was to identify the products, application areas, production processes and technological properties associated with the optics offered by the survey participants. The survey was supported by the European Commission's 6th framework programme as a part of the project "Production4micro". It develops precision glass moulding as a replicative optics production process. According to the results of the survey, this technology has a high future potential. Although it is at the present only employed reluctantly by the survey participants, a large part of their optics could beneficially be manufactured with precision glass moulding.

Glass optics are much more important for the survey participants than plastic optics which account for only ten percent of their production volume. As can be seen in Picture 1, the largest part of glass optics is still made using conventional processes such as grinding and polishing. Only the smallest part of all glass optics made by the survey participants is produced by moulding.



Picture 1: Percentages of the different production processes in sales of the study participants

An analysis of the survey's results yields that the potential for application of precision glass moulding is much higher than the actual percentages. The survey participants were asked for various technical properties of their produced optics, for example the diameters. Then, it was analyzed which percentage of the produced optics could potentially be made by precision glass moulding, regarding each single parameter. For example, very large diameters can not be made with precision glass moulding – thus, the percentage associated with the diameter represents the part of the survey participants' current production that is below this diameter. Picture 2 shows the evaluation for the most relevant technological parameters – it can be seen that, according to the results of the survey, a much larger part of the optics could be manufactured with precision glass moulding than is currently being done.



Picture 2: Suitability of the produced optics for precision glass moulding regarding the most import technical properties

Precision glass moulding is suitable for the production of almost all optical geometries, from simple spheres to complex freeform surfaces and Fresnel lenses – however, simple geometries can today still be manufactured much cheaper with conventional processes and should therefore be considered as not apt for the new technology. The reason for this is that precision glass moulding requires comparably expensive moulding tools. The manufacturing of such moulding tools only pays off if they enable sufficient savings by the efficient replicative production of complex geometries and / or large volumes.

Regarding all other properties, the suitability of precision glass moulding is comparably high: with a share of more than ninety percent of the total production volume, the curvature that can be made with precision glass moulding is suitable for almost all optics. The production technology is also flexible regarding the functional configuration: single optical elements can be made as well as one- or twodimensional arrays. Only the smallest part of the survey participants' optics are made with a different functional configuration. Thanks to their variable properties and capabilities, isothermally moulded glass optics are furthermore qualified for a vast range of applications like for example lasers, cameras or LEDs. Precision moulded optics are not only available for the spectral range of the visible light but also for infrared radiation. Thus, they cover the main part of the produced optics regarding the spectral range. The ultra violet spectral area, which is difficult to access for moulding due to the extremely hard quartz glasses that are used there, only accounts for about ten percent of the optics made by the study participants. Because optics should not exceed a diameter of 30 mm for the moulding, due to the available space in the

common machines, the process is mainly used for micro optics. However, more than half of the survey participants' optics are in that diameter range.

After a difficult year 2009 with a small but significant decline in sales, study participants expect a constant growth of sales for 2010 and the following years. Through this, the high level of 2008 is expected to be reached again in the close future and to be surpassed afterwards. Market-internally, survey participants expect a technological shift towards and significant growth rates for aspherical and freeform optics, which are comparably well producible with precision glass moulding. Therefore, the future perspectives for this technology are excellent and it is to be expected that the number of optics that are manufactured via precision glass moulding will raise continuously.

For more information on Production4 μ please contact:

Fraunhofer IPT, Sebastian Nollau, Sebastian.Nollau@ipt.fraunhofer.de, Tel. 0049 241 8904 271