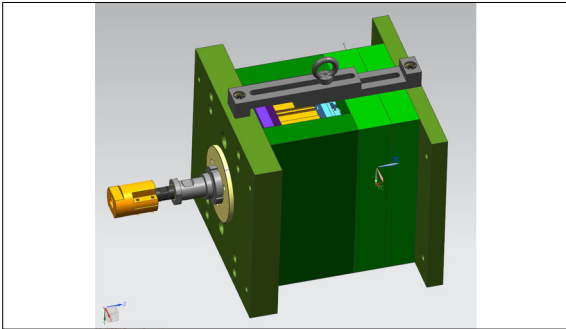




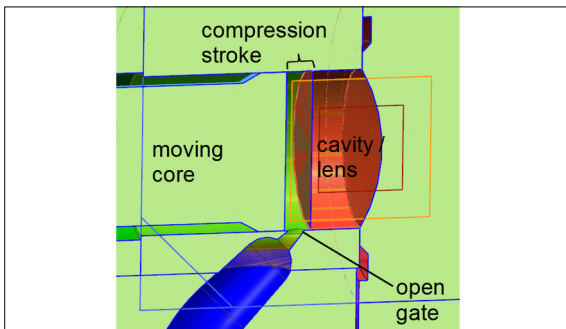
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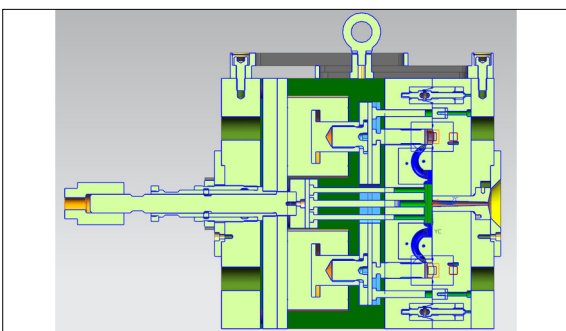
Design & development of a plastic lens mould for injection compression moulding



Mould for the beam expander collimator lens.



Moving core and cavity (sectional view).



Mould (sectional view).

Objective: Two of the biggest recent economical and technical trends are digitalisation and miniaturisation. They go hand in hand and increase the demand for even smaller optical lenses fulfilling highest quality standards. Injection moulding and injection compression moulding are state of the art processes for manufacturing smallest optical devices of high complexity in high quantity and required quality. For this bachelor thesis there have been many initial objectives of which some have changed during the thesis. Others even had to be eliminated in order to focus on the two main objectives:

- Research on polymer optics and related manufacturing processes as well as
- Designing and drafting of a lens mould.

The secondary objectives have been:

- Exploration of the plastic lens mould manufacturing process
- Implementation of mouldflow simulation for injection moulding
- Hands-on operation of injection moulding

Procedure / Result: The design method according to VDI 2222 was used in this project. The project started with research on polymer optics and its basic physics, suitable materials, applications, involved processes and quality aspects of polymer optics. The requirement specifications define all aspects for designing a mould for the beam expander collimator lens. Based on a morphological box multiple concepts have been generated and the best one was chosen. Based on the conceptual mould design, the final design could be constructed. Basic filling simulations have been run. For this thesis Siemens NX 10.0 and Autodesk Moldflow Insight 2012 / Synergy 2016 were used.

Result: For the beam expander collimator lens a mould implementing a modified injection compression moulding process was designed and its 3D model was built. Since there should not be any marks on the lens' surface the gate will be closed by a moving core which also impinges compression pressure in order to achieve the required optic quality. The temperature control is missing due to lack of time to undertake a proper thermal design including a simulation. Cooling channels matching a proper thermal design have to be added. Also screws and other standard parts have to be added to the assembly. Furthermore, a mechanical simulation should be carried out to ensure mechanical stability and an advanced filling simulation of the modified injection compression process would help to verify the achievable optical quality of the lens. To create manufacturing documents all materials and necessary surface coatings have to be specified and the tolerancing has to be finished and documented on the drawings.