

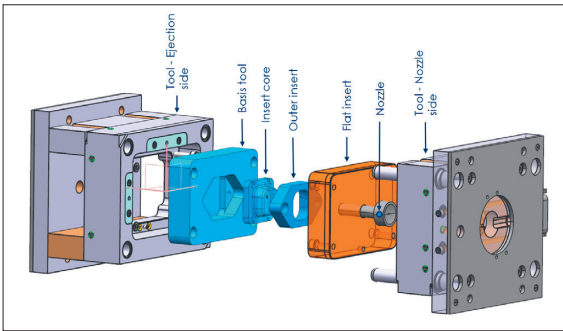


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Subject Area	Kunststofftechnik

Printed Molding Tools

Suitability of 3D-printed tool inserts



Tool concept

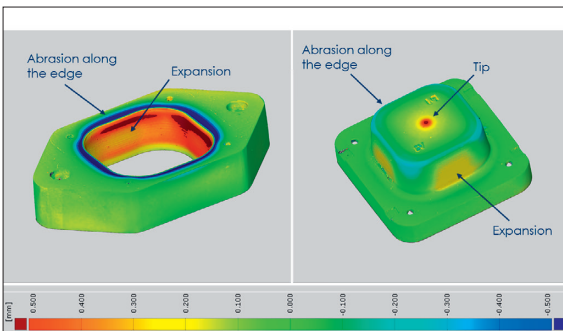
Introduction:

- Additive manufacturing offers excellent possibilities for prototyping. Geometry and function can be tested early in the development stage. For further tests, such as physical performance, components that are close to the series production are required.
- Unfortunately, the available materials for rapid prototyping processes are limited. Therefore, the material properties of the prototypes are often very different from the parts mass-produced in a factory.
- In this paper, the use of printed tool inserts is evaluated and a concept is developed about how such inserts can be designed and what materials can be used. The concept is examined using examples and will then be further developed and tested. This work should show the limits of additive manufactured inserts.

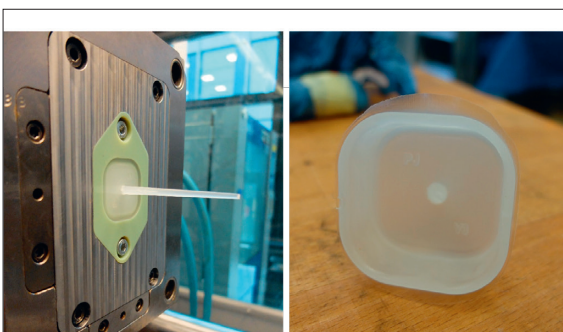
Proceeding:

- This project is systematically worked out by dividing it into the main phases: literature research, conception stage, design phase, tests and evaluation.
- The experiment has also shown that printed tool inserts require a bigger draft angle. Edge blends should also be designed as large as possible. The experiment has shown that these are very susceptible to deformation.
- The SLA-printed inserts of HT resin are not suitable for injection molding, as the material is too brittle. They don't withstand the pressure during the injection molding process. Both inserts broke at all four corners in the first shot.
- PJ-printed inserts reveal good accuracy and reproducibility. The inserts show almost no wear after 20 samples with PP. The wear after 10 samples with POM was low in comparison to the FDM-printed inserts.
- The samples that are made with the FDM insert have a low reproducibility. The insert deforms during the injection process. The surface quality is also low. However, 20 samples from PP or 10 samples from POM can be produced with such inserts.

Result: A concept has been developed in which various inserts can be tested. Experiments were performed with FDM-, SLA- and PJ-printed inserts. The abrasion and deformation of the inserts was analyzed with the injection materials PP and POM. To get an accurate picture of the abrasion, a 3D-Scan with GOM is done. The inserts are scanned before and after the experiment, then the two scans are compared.



3D Scan – polyjet insert / POM injection



Sample – polyjet insert / PP injection