TECHNISCHE HOCHSCHULE DEGGENDORF

ADDMOLD

ADDITIVER FORMENBAU FÜR KLEINSERIEN IM KUNSTSTOFFSPRITZGUSS.

ADDMOLD

Weitere Infos

Abstract

Projekttitel/ Project title:

Addmold - Development of a modular injection mould including high-resolution 3D printed mold nests

Einleitung/ Introduction:

The growing diversification of different geometries of products within the same production series and the fact, that product life cycles are getting shorter and shorter, is a tough challenge for the mechanical engineering industry. Especially in fields with high investment costs, such as tooling for injection moulds, short product life cycles create economical disadvantages.

Injections moulds are primary machined out of tool steel, which has great mechanical properties for the mould. The machining of the steel is cost intensive, so the production of plastic parts using injection molding is profitable only for a large quantity of parts without changes to the mould. A way to reduce the iterations of tooling is rapid prototyping. In this process, the finished plastic parts are 3D printed for a review of the design and geometric properties. These prototypes are not suitable for product approval or long-term studies. However, in many fields of industry, especially in the medical engineering, such long-term studies and approvals are essential and required.

Ziel/ Aim:

A solution for these problems is the development of a modular injection mould with additive manufactured mold nests using the stereolithography process. This process uses a UV-reactive resin that is cured by a laser (SLA) or a digital light processing unit (DLP) layer by layer. Due to the high resolution, parts with a high level of detail and a smooth surface finish can be created by using this technology. Furthermore, it is possible to realize a fast, efficient and economic process chain for mold making to produce prototypes and/or small series of plastic parts for medical engineering. Integrated cooling channels near the injection cavities, which is possible through the additive manufatcuring process, reduce thermal stress inside the mould. The aim is to get 20 % faster injection mold cycles than usual due to a more efficient cooling. Sensor units near the mold nest surface, that are integrated during the printing operation, are used for monitoring the injection molding process. This leads to a faster and easier parameterization of the injection mold process. To increase the wear resistance of the 3D printed injeciton moulds, a diamond-like-carbon (DLC) coating will be developed.

Methode/ Method:

Different resin systems for the stereolithography process will be evaluated through differential scanning calorimetry and various mechanical tests regarding their thermal and mechanical properties. A compact sensor system for pressure and temperature monitoring that can be fitted into the 3D printed injection moulds has to be designed. DLC coatings with different dopings and their effect on the adhesive strength of the injected polymer and on the wear resistance of the moulds will be researched.

Ergebnis/ Result:

In first intermediate results, a suitable 3D printing material that can withstand temperatures up to 220 °C was determined. A compact sensor systems with dimensions of 6 x 20 mm is simulated and ready for testing. Also, first dopings of the DLC coating and the adhesive strengths of it on the mould, aswell first injection tests are in process.

Projektbeteiligte/ Project participants:

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H. Heinz Meßwiderstände GmbH – Sensor system development
Kaiser Ingenieurbüro GmbH – Process development

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