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ADDITIVE MANUFACTURING IN MOLD AND AUTOMOTIVE CONSTRUCTION WITH LMD AND SLM

Task

Within the scope of the Fraunhofer key project »E³ Production«, the resource efficiency of additive manufacturing chains is being investigated. To do this, two reference components (an injection mold and an automobile steering knuckle) are being used to implement the additive manufacturing chains and to determine the resource flows along these manufacturing chains (in particular energy, material and time). The additive manufacture of the reference components forms a basis to evaluate the resource efficiency of additive manufacturing chains and represents a central task of the project. The injection mold is manufactured with LMD, the car steering knuckle with SLM. Balancing resource flows begins with the powder preparation and ends with the finishing of the reference components.

Together, the project partners and Fraunhofer ILT are balancing the resources along the conventional production chains for the manufacture of components. With this, they are creating a foundation to assess the acquired resource data.

Method

The work to prepare the reference components starts with the selection of suitable materials. The injection mold is manufactured with LMD from the hot-working steel 1.2343, whereas the car steering knuckle is made with SLM from the aluminum alloy AlSi10Mg. The starting point for the production of the reference components are the CAD data provided by the

partner company (BMW Group and WBA). An appropriate building strategy has been developed for the dimensioning of the LMD process. The CAD data are used with the software »LMDCAM2« to implement a final contour path planning for the construction of the injection mold. For the dimensioning of the SLM process, an adapted support strategy for positioning the steering knuckle in space will be developed and the guidance adapted to the protective gas flow.

Result

The components have been made by both methods and checked for their dimensional stability. The allowance of the side walls of the injection mold is not more than about 800 µm. The knuckle has an average allowance of about 400 µm.

Applications

The investigations presented here are focused on applications in the mold and automotive industry, but the findings can also be used in other industries.

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- 3 Injection mold produced with LMD.
- 4 Automobile steering knuckle produced with SLM.