



ADAPTIVE SLM PROCESS STRATEGY

Task

As the SLM process undergoes further development, a central focus lies in the increasing productivity for series production. The conflict between better surface quality and quick building rates constitutes a hurdle in this development. To begin solving this conflict, Fraunhofer ILT has developed the skin-and-core process strategy. In it, the component part is separated into skin and core areas dependent on geometry, to which different process parameters are assigned. In view of the overall process chain, the skin-and-core process strategy does not, however, offer the best possible solution to the aforementioned conflict. Fitting surfaces, which need a milling process after the SLM process, are produced, for example, with better surface quality and lower build rate. Consequently, a function-dependent classification of component parts is necessary, one which takes the post-treatment processes (e.g. high build rate for sectors that are machined afterward anyway) into consideration. Adaptive process strategy makes such a classification possible. Therefore, the task here consists in implementing adaptive SLM process strategy and quantifying the savings in process time.

Method

A double-row vane cluster is used to investigate adaptive SLM process strategy on the working material Inconel IN718 within the scope of the innovation cluster AdaM. In a first step, the process parameters are identified for the respective area of the

adaptive SLM process strategy. In a second step, the vane cluster is manufactured with the conventional process strategy, the skin-core, as well as the adaptive process strategy, and the process times are determined.

Result

As a result, process parameters were identified that result in a density of $\rho \geq 99.5$ percent for the respective areas of adaptive SLM process strategy as well as for the transition between these areas. In the manufacture of the vane cluster, the process time is reduced by a factor of 1.9 compared to conventional process strategy and by a factor of 1.6 compared to the skin-core process strategy.

Applications

The current research on adaptive process strategy is addressing turbomachine construction and can be transferred to other branches using series production (e.g. the automobile industry).

The Fraunhofer innovation cluster »AdaM« is funded by the European Regional Development Fund (EFRE): »Investment in Our Future«.

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3 Vane cluster produced with SLM.

4 SLM production of vane clusters.