



PROCESSING ALTERNATIVELY MANUFACTURED POWDER MATERIALS WITH SLM

Task

When compared to conventional manufacturing, Selective Laser Melting (SLM), also known as Laser Beam Melting or Laser Powder Bed Fusion (LPBF), still generates high component costs, which constitute an industry-wide hurdle for it to spread further into series applications. Although SLM systems are becoming more and more productive, the cost of powder material, in addition to machine costs, also plays an increasingly important role. Two factors are regarded as cost drivers in powder production: first, production by gas atomization and, second, the relatively narrow specification limits of the powder particle sizes, the latter of which currently only make use of a very small proportion (in part less than 20 percent) of the atomized material in the SLM process.

Method

In this context, Fraunhofer ILT is investigating the extent to which powder particle size can be expanded and more favorable powder production methods used, such as water atomization, using material 1.4404 as an example. For this purpose, it has carried out investigations into characterizing the powders in terms of chemical composition, flowability

and particle morphology, as well as analyzes of applicability and the nature of the applied powder layers. Furthermore, the investigations are looking into determining SLM process parameters to achieve relative component densities of at least 99.5 percent.

Results

The institute successfully demonstrated that water-atomized powders of 1.4404 in the particle size range of 0 to 74 μm can be applied and processed within the scope of the investigations. Despite the reduced build rate in the processing of the water-atomized powder with erratic particle morphology, component costs could be reduced by more than 30 percent, demonstrated by a profitability analysis.

Applications

The powders tested here can be used in any SLM plant in many different industries. They are particularly interesting for applications with strict targets in terms of component costs such as in automotive mass production.

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1,2 SEM images of gas (l) and water-atomized (r) powder made of stainless steel 1.4404.