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FUNCTIONAL INTEGRATED RIM SUPPORT WITH INTERNAL LATTICE STRUCTURE

Task

Conventional manufacturing processes can only fulfill the increasingly high demands on functional component parts to a limited extent. Additive manufacturing processes such as Selective Laser Melting (SLM) offer the unique opportunity to build complex components while saving resources. Conventionally, the automobile rim support is manufactured out of four different individual parts by means of aluminum die-casting and then welded together in an additional manufacturing step. When the individual parts are bonded together, distortions can occur due to heat input. The goal of this project is to design the rim support stiffer and lighter with an internal lattice as a functionally integrated component part and to build the part using SLM.

Method

To design the rim support anew, it is necessary to quantify the mechanical properties of additively manufactured lattice structures. For this, individual lattice structures were built with different unit cells and underwent compression tests according to DIN 50134. A f2czz structure was integrated into the conventional design of the rim support. The individual parts of the component were aggregated into one part. To remove the powder in the cavities, two openings are placed on each side. SLM was used to build this innovative component design on an EOS M270 with a laser power of 195 W out of AlSi10Mg powder. A subsequent heat treatment increased the strength of the basic material.

Result

In terms of load and manufacture, compression tests according to DIN 50134 show that an f2czz lattice structure type is ideally suitable for use as in a rim support. Thanks to the anisotropic character of the f2czz lattice structure, a 30 % higher stiffness can be attained in the load direction by reducing the weight of the component. In a successfully completed Formula Student competition, the rim support stood up to conditions in a race situation proving the durability of SLM parts.

Applications

Important fields of application are in the aerospace and automobile industries as well as in medical technology.

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3 View in the wheel bearings of the »Formula Student« racing car with integrated rim support.
4 Rim support built by means of SLM with internal lattice.