MULTI-LASER TECHNOLOGY

Multi-laser systems are intended to make powder-based laser beam melting more cost-effective, and thus more attractive for industrial applications and serial production. Current multi-laser systems operate with up to twelve lasers. With an increasing number of lasers in use, higher productivity can be achieved. However, the challenges are in determining of suitable exposure strategies and an optimal working field for each laser. Thus, the quality and properties of the parts are ensured and, at the same time, the efficiency of the process is increased. The DMRC is investigating different process strategies that should be applied to different multi-laser systems to identify their influence on the resulting material properties.

FIGURE 1: Multiple laser interacting with the powder bed (Source: SLM Solutions)

FIGURE 2: Multi-laser system SLM NXG XII 600 (Source: SLM Solutions)

PROJECT OVERVIEW	
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Due to the use of simultaneously exposing lasers, the production time of additively manufactured parts is considerably shortened. A large number of process strategies offers an unprecedented number of implementation options with regard to laser beam guidance and consequent increases in productivity. The more lasers involved in the additive manufacturing process, the more challenging it is to control the manufacturing environment. In addition, avoiding intersecting laser beams results in increased fume formation and weld spatter occur which adversely affect the process. These factors can be detrimental to the density, mechanical properties, and overall performance of additively manufactured parts.

Objective

The goal is to identify suitable appropriate exposure strategies to ensure high productivity, determine the impact on the part properties, and ensure the quality achieved by using single-laser systems.

Project Scope

The test specimens are produced with both, single laser and multi-laser scanning strategies.

The following characteristics are determined:

- relative density and microstructural features
- hardness
- room-temperature tensile properties
- high-cycle fatigue behavior
- impact toughness

Finally, a large component shall be produced according to the previously ascertained scan strategy.