Innovative part design optimized by Micro Laser Sintering – the key to success

In the semiconductor industry the process TLS-Dicing™ is used to separate wafers. Therefore the german company 3D-Micromac AG offers an appropriate manufacturing system. This process is based on thermally induced mechanical forces separating brittle semiconductor materials like silicon or SiC. Combining a defined voltage field, a laser-based heating and water cooling immediately after, a single crack is generated in order to separate the chips from a wafer. For the water cooling a spray nozzle is used which has been assembled out of seven conventionally manufactured components so far.

Example: TLS-cooling nozzle manufactured with a Micro Laser Sintering system by 3D MicroPrint GmbH; nozzle aperture size ø240 µm, nozzle wall thickness 200 µm; material 1.4542 (17-4PH)

Figure 1: side view

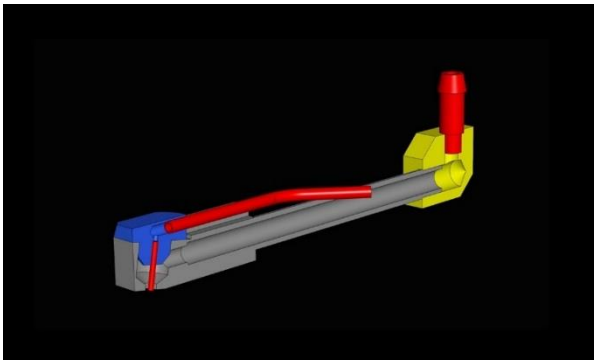

Figure 2: CAD model of a conventional TLS-cooling nozzle

Figure 3: CAD section view

Source: 3D MicroPrint GmbH

So far TLS-cooling nozzles were manufactured of 7 components made of the materials stainless steel and brass. The assembly consisted of filigree components prepared by lathe, milling and bending. In the beginning of the cooperation **3D MicroPrint GmbH performed a comprehensive functional analysis of TLS-cooling nozzle**.

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It was found that an optimization of the air flow within the swirl chamber allows a more uniform water atomization. This impact profoundly improves the process quality. The optimized cooling characteristics create no additional particles and impurities. The reduced heat affected zone of the material eliminates micro cracks and delamination. The absence of joints between the individual components results in an improved robustness of the TLS-cooling nozzle. In addition, other functions such as a reference geometry and a mounting thread were added. By using the Micro Laser Sintering technology provided by 3D MicroPrint GmbH the manufacturing costs of the TLS-cooling nozzle lowers by over 60% and the lead time shrinks from over 4 weeks down to 2 working days.

Metal parts and assemblies for fluidic applications can be profitably manufactured on Micro Laser Sintering systems by 3D MicroPrint GmbH. By applying an innovative integration of functions and the increased robustness by eliminating joints between the components, the technology provides entirely new opportunities to the customer.

The featured part was manufactured with a DMP50 GP Micro Laser Sintering system developed by 3D MicroPrint GmbH.

The technology

A 3D-CAD model of the target geometry contains all details of the final part. This CAD model is split into several cross sections, called layers. During manufacturing, a thin layer of powder is applied to a build platform. The powder is selectively fused by a laser beam according to each cross section. After that the building platform is lowered, the procedure of powder coating, fusing and platform lowering is repeated layer by layer, until the part completed.

About 3D MicroPrint GmbH

3D MicroPrint GmbH is known for high-precision micro parts manufactured by Micro Laser Sintering. Since the company was founded in 2013 by EOS GmbH and 3D-Micromac AG, the additive manufacturing process has been further developed for micro parts and has been adapted to run an industrial production. Today we are providing our customers the entire portfolio of design consulting for additive manufacturing, feasibility studies and parts production up to their own 3D MicroPrint Micro Laser Sintering system. Furthermore 3D MicroPrint offers material developments for exclusive technologies on demand. The key applications for micro parts are medical industry, wearables, semiconductors and micro industries, high frequency applications as well as aerospace.

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