

LASER POLISHING OF ADDITIVELY MANUFACTURED PLASTIC COMPONENTS

Task

As demands on individualized products increase, new manufacturing processes, especially additive manufacturing, are conquering the market. For plastics, common additive processes are Selective Laser Sintering (SLS) or Fused Deposition Modeling (FDM). Despite their great potential for individualization, they have the particular disadvantage that the surface roughness after the process is too high for many applications; therefore, surface finishing is often necessary. Current finishing procedures are, for example, vibratory or manual grinding. However, these have deficits such as edge rounding, high costs or incorporation of abrasives in the component. Therefore, Fraunhofer ILT is developing a non-contact, laser-based polishing process for additively manufactured plastic components.

Method

When plastic surfaces are irradiated with laser radiation, the material can be melted close to the surface without affecting the component geometry. In the molten state, cracks and pores on the surface close. Furthermore, the roughness of the surface is reduced by acting surface tension forces. The surface then resolidifies in the smoothed state.

Results

Investigations on the materials PA6 and PA12 show that the surface roughness can be significantly reduced and the gloss of the surface increased by laser polishing of SLS components. With PA12, the roughness can be reduced by laser polishing with continuous CO₂ laser radiation, for example by a factor of 10 from the starting roughness (after SLS), i.e. from Sa = 10 µm to Sa = 1 µm. Not only is the roughness reduced, however, but pores on the surface can also be closed to a great extent. Furthermore, other materials can be laser polished, for example, PMMA, PEEK and PC.

Applications

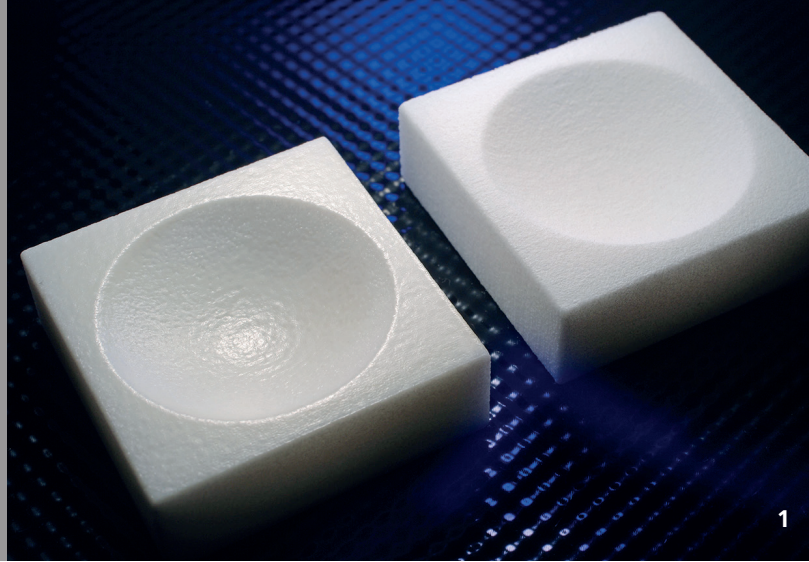
The laser polishing of additively manufactured plastic components can be employed wherever a surface finish is necessary. Examples can be found in medical technology or the automotive industry.

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1 Laser-polished, SLS-made plastic component made of PA12 (left) and initial state after the SLS process (right).



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