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imkf INSTITUT FÜR MASCHINENELEMENTE
KONSTRUKTION UND FERTIGUNG
PROFESSUR ADDITIVE FERTIGUNG

Topic Definition for a MASTER THESIS

for

Topic: **Effect of Plasma Electrolytic Polishing Parameters on Surface Roughness and Edge Rounding of PBF Components**

Powder Bed Fusion (PBF)-based additive manufacturing enables the fabrication of complex metal components with high design freedom. However, the layer-wise process and partially fused powder particles often result in high as-built surface roughness, which can adversely affect component performance. Plasma Electrolytic Polishing (PEP) is an environmentally friendly and efficient post-processing technique capable of producing smooth, glossy surfaces. Although increasing polishing time improves surface finish, it also causes progressive edge rounding, where initially sharp edges become rounded, leading to dimensional deviations and reduced geometric accuracy. Most existing studies focus on improving surface roughness, while the effect of PEP on edge rounding across different edge angles remains unclear.
This thesis aims to systematically investigate the relationship between surface roughness and edge rounding with PEP polishing time. Standardised test specimens will be fabricated, polished under controlled conditions for varying durations, and characterised using confocal microscopy. The experimental results will be used to establish quantitative relationships among polishing time, surface finish, and edge-radius evolution. Based on these findings, an optimal polishing window will be identified, and design recommendations will be proposed to account for polishing-induced geometric changes

The following tasks should be completed:

- Manufacture standardised PBF specimens with defined edge angles (30°, 60°, and 90°) and perform PEP under controlled conditions with varying polishing times.
- Characterise the evolution of surface roughness and edge rounding using confocal microscopy and quantify the influence of polishing time for each edge geometry.
- Develop the relationships between polishing time, surface roughness, and edge radius to identify an optimal polishing window that balances surface finish and geometric accuracy.
- Investigate design modification or compensation strategies to account for polishing-induced edge rounding in the design of PBF-manufactured components.

For the defence of the thesis, a poster and a video must be submitted according to the specifications of the professorship.

Issue: Klicken oder tippen Sie, um ein Datum einzugeben.
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