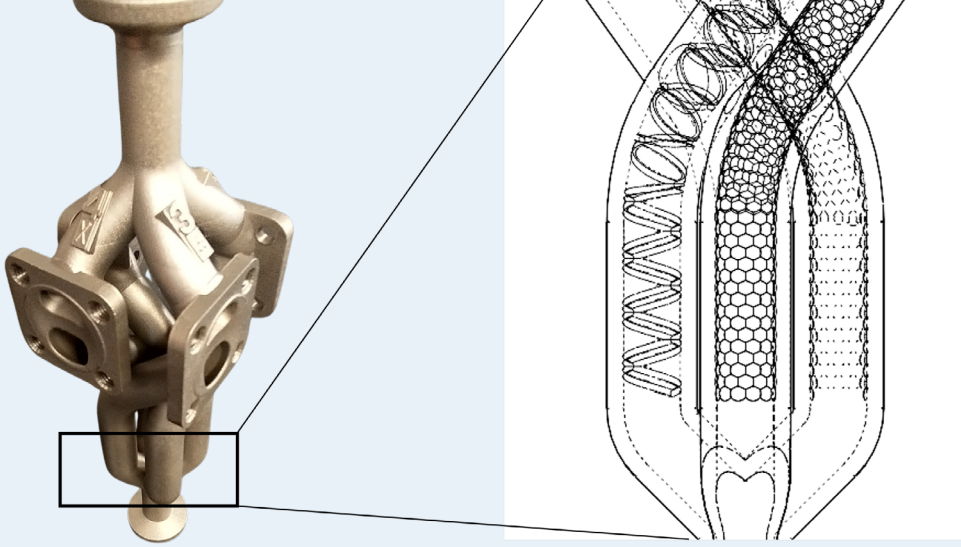

Laser Powder Bed Fusion in the Food Industry

Strategies for Surface Modification to Eliminate Residual Contaminants

Metallic 3D printing holds great potential, but its application in industries such as food and pharmaceuticals is limited by insufficient surface roughness.

Within the HygAM and HygAM 2 projects, the effects of post-processing methods and macro-structures on the surface properties and the cleanability of 3D-printed components for hygienic purposes were investigated. Various structuring approaches were analyzed and their impact on cleanability demonstrated. It was shown that both macro-structuring and post-processing can achieve macroscopic and microbial cleanability. Combining post-processing with macro-structuring further improves microbial cleanability to a level comparable with conventionally manufactured pipes.

In Figure 1, the Relative Light Units (RLU) are shown; this is a unit of measurement in bioluminescence cleanliness measurement used to quantify the amount of adenosine triphosphate (ATP), adenosine diphosphate (ADP) and adenosine monophosphate (AMP) on a surface. The RLU value indicates how clean a surface is: the lower the value, the less contaminant is present and the cleaner the surface.

As a project outcome in HygAM 2, a valve block specifically designed for 3D printing was developed. The block's channels feature various simulation-designed patterns which, in combination with post-processing, meet the reference contamination values.

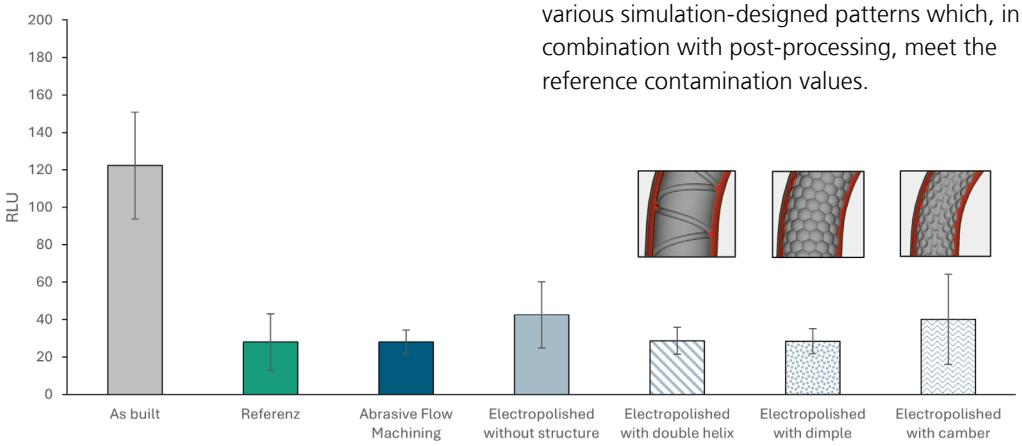

Figure 1: Cleanliness of various surfaces with differing surface properties following a standardized cleaning procedure. © Fraunhofer IWU

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exhibit overview