CONTROLLING ROUGHNESS

Exploring the influence of 3D printing on the roughness of a bio mixture to design controlled acoustic properties

This project explores the potential of Omlab's bio-circular material BM-1 for architectural applications, focusing on its use in fabricating indoor walls. The project investigates how 3D printing can be leveraged to actively design and control BM-1´s material behavior, to enhance its unique opportunities.

By varying 3D printing toolpaths, the project aims to exploit the relationship between 3D printing parameters and material roughness as a design opportunity. Through an experimental methodology, the project demonstrates that surface roughness is highly dependent on toolpath design. Using the impedance tube method for absorption coefficient measurement, the project reveals the influence of 3D printing parameter variations on the acoustic absorption properties of BM-1 specimens.

The findings of the project show that additive manufacturing enables the design of multi-scale surface roughness that influences acoustic performance. This opens new pathways for 3D printing with bio-based materials in architectural contexts. Positioning roughness not as a limitation, but as an asset controlled to meet architectural needs.

Figure 5 : Demonstrator

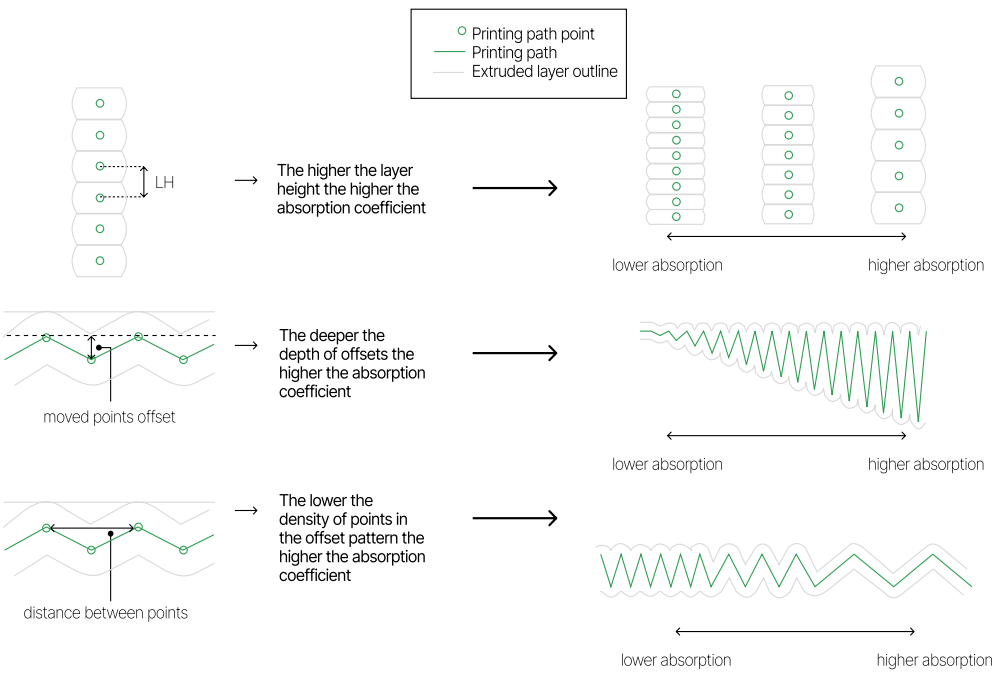

Figure 1 : Found tendencies and design guidelines

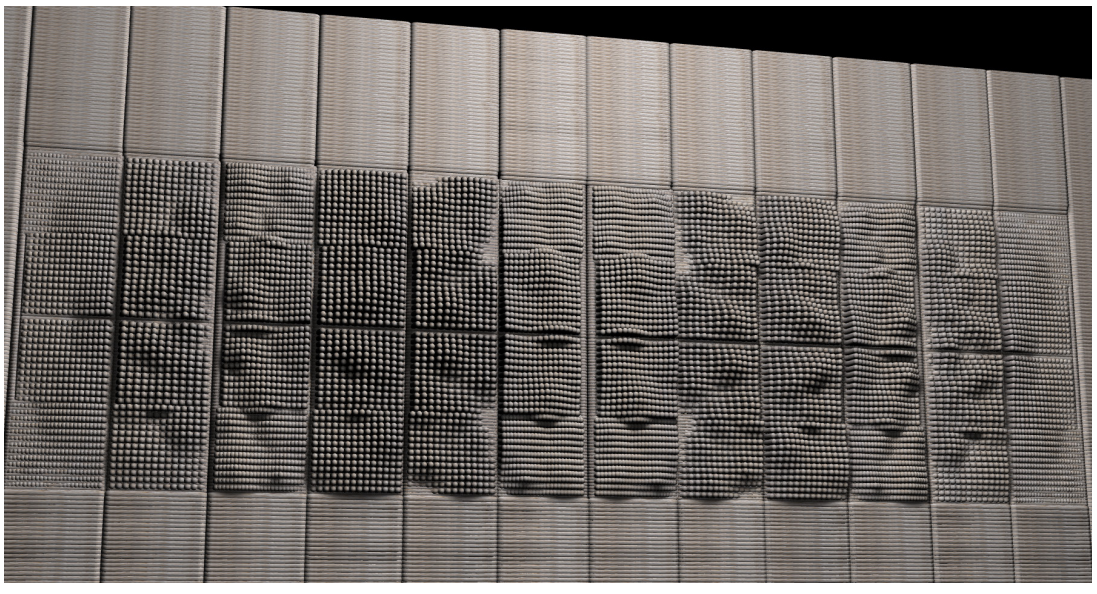

Figure 2 : Absorptive wall designed with the defined design guidelines

Figure 4 : Controlled roughness

Figure 3 : Block connectivity

MASTER THESIS
Integrated Product Design
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