

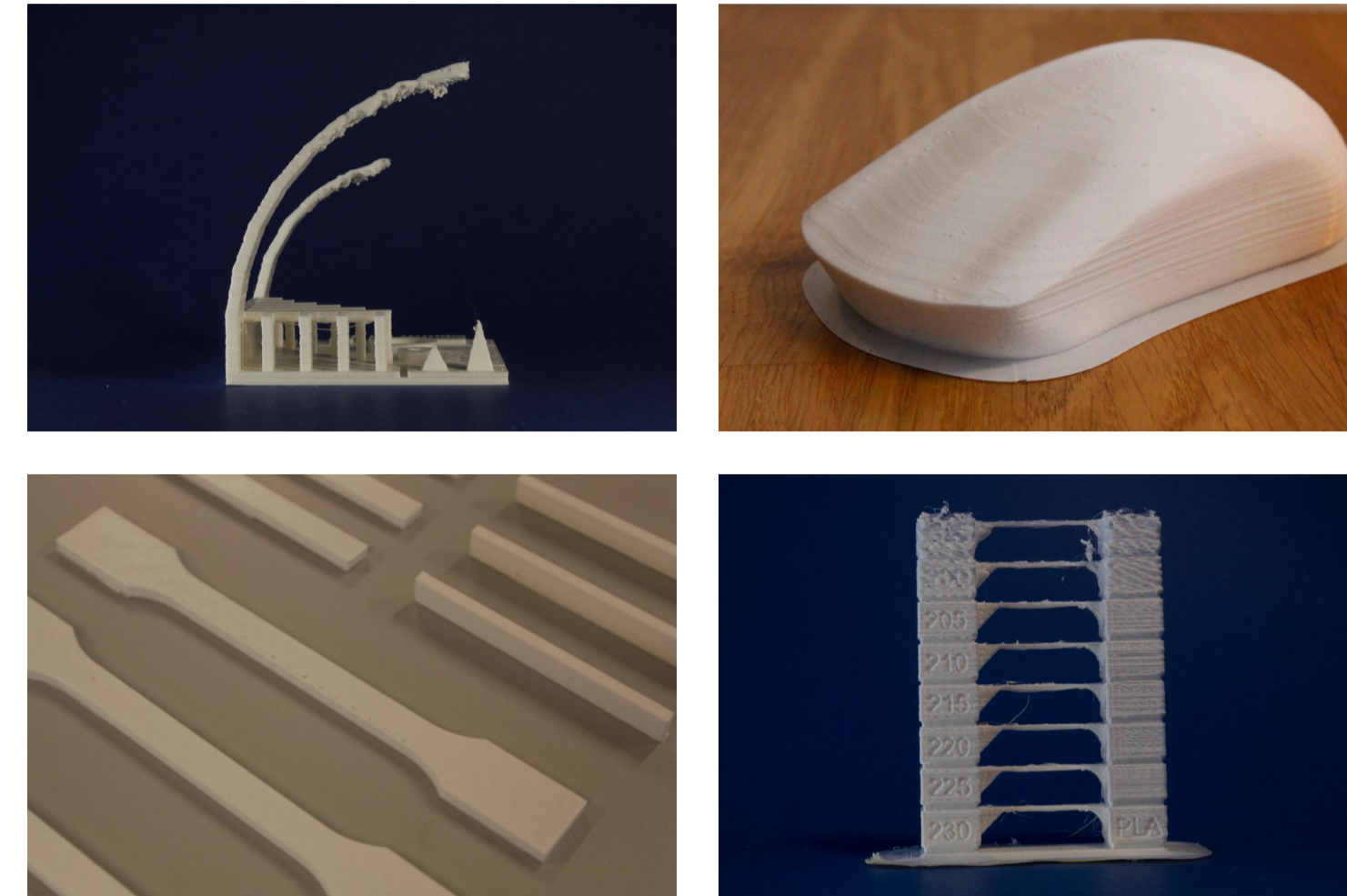
RECYCLING 3D PRINTS

Enabling Material Reuse in Prototyping Facilities

THE PROBLEM

In Fused Deposition Modeling (FDM) for rapid-prototyping, the 3D printed parts usually have a short life, generating a constant stream of waste material and lost value. This issue becomes more relevant in the early stages of product development, where 3D printed prototypes become rapidly obsolete due to design iterations and advances in the project.

Polylactic Acid (PLA) is one of the most popular in early prototyping. As a result, prototyping facilities generate a constant waste stream of PLA from failed prints, support material and obsolete prints. A material stream that is currently not being reused, recycled or industrially biodegraded.



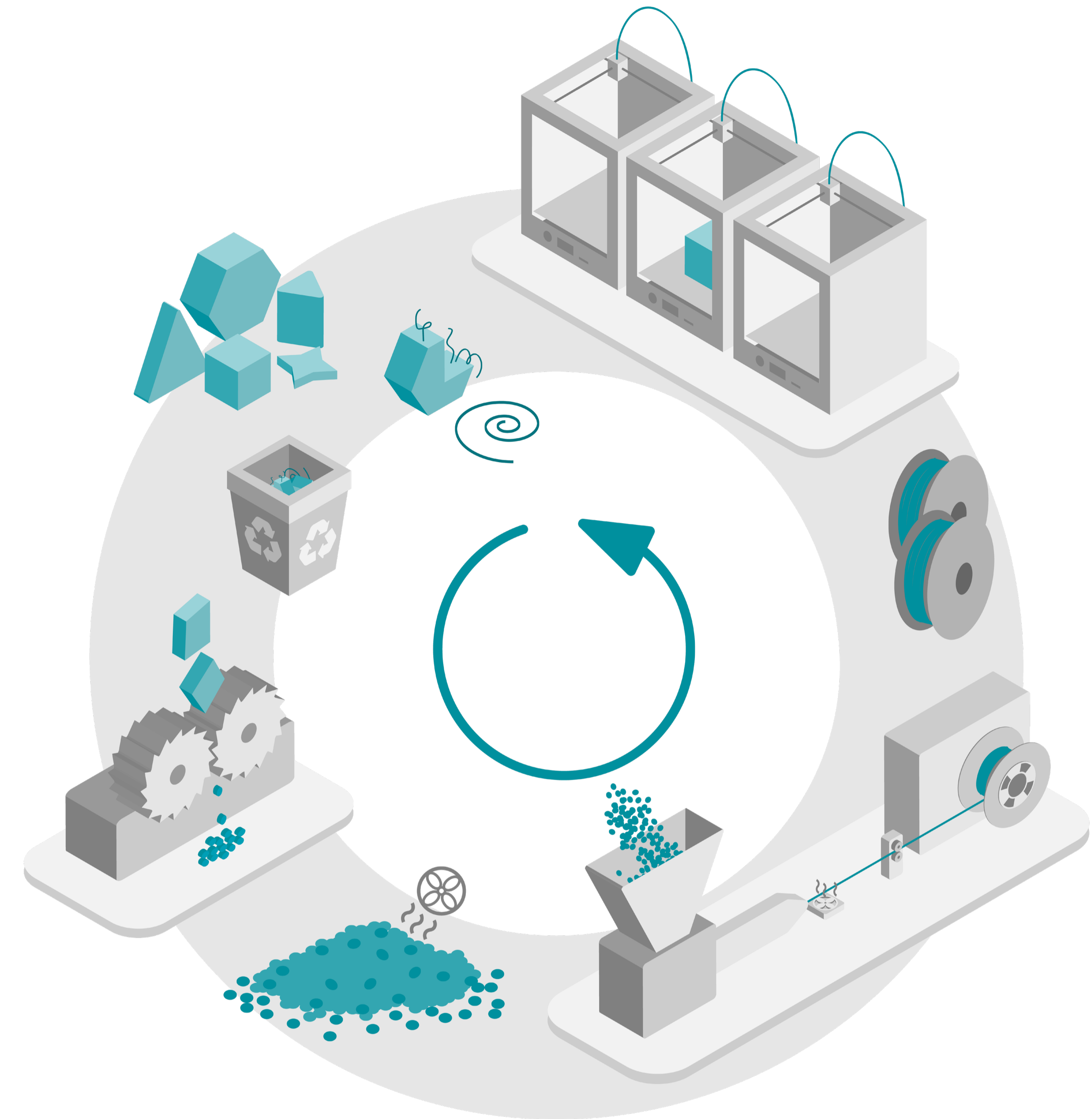
RESEARCH




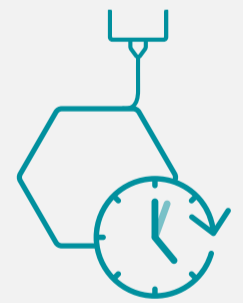
This project investigated the opportunity of reusing this waste stream by recycling it back to FDM filament, closing the material loop in a prototyping facility context.

First, insights from industry experts, prototyping users and state of the art were collected and an opportunity was identified in low-fidelity prototyping. Then, the production and low-fidelity printability of recycled PLA from 3D printing waste was tested. The printability results demonstrated that recycled PLA filament produced with a desktop recycling setup can be 3D printed, achieving similar low-fidelity prototyping capabilities for design projects as virgin material.

IMPLEMENTATION

The findings gathered in the research phase were converged into a future vision, a roadmap and a short-term solution to explore and facilitate its implementation. Additionally, a printing guide summarized the adjustments and recommended settings for future end-users and a design case study demonstrated its feasibility and implications on the design process in practice. The solution is evaluated by a prototyping facility and the recommendations for its implementation are outlined.



 low mechanical strength	 highly brittle	 low surface quality	 short printing times
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12th February, 2021
Integrated Product Design

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