

Influence of extrusion time and temperature on the mechanical properties of a printing filament.

General context:

The association EPFL Xplore wants to develop a 3D printed parts recycling machine. After one semester of development, a first version of the machine is ready. Nevertheless, to improve the capacity of the machine and the general understanding of the parameters, a lot of work remains to be done. This is why we offer semester projects to EPFL students. The recycling process of 3D printing filament can be decomposed in the following steps: grinding, drying, extrusion, cooling and spooling.

Project description:

The objective of this project is to enhance our comprehension of the impact of extrusion time and temperature on the mechanical properties of recycled filaments. The student will meticulously select 2 or 3 specific mechanical properties and will explore their evolution when extrusion time and temperature are modified. A common DOE with another project will take place in order to study the cross influence of the parameters.

Furthermore, the student will be a part of the Xplore plastic recycling team, they will need to attend the team meetings as well as the working sessions.

Tasks:

- Strong literature review and familiarization with different subjects:
 - o PETG structure and properties
 - o Influence of the polymer structure on mechanical properties
 - o Effect of 3D printing on the polymer properties
 - o Influence of extrusion time and temperature on the polymer structure/properties
 - o Design Of Experiments
- Determination of the DOE (common with another student).
- Application of the DOE.
- Determination of the experimental method to measure the chosen mechanical properties.
- Apply this method.
- Analyze the effect of recycling process on mechanical properties.