

# **DESIGN A LABORATORY 3D FILAMENT EXTRUDER**

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## Summary

Using additive manufacturing methods like Fused Deposition Modeling (FDM) can create complex industrial applications by printing high-quality materials with suitable characteristics. FDM technology aligns with the "industry 4.0" philosophy and is a sustainable enabler for producing customized, high-quality products in intelligent factories with high productivity and cyber-physical integration.

However, FDM's potential for constructing components with desired functional properties could be improved by the availability of inexpensive filament materials.

To address this limitation, this study aimed to design a 3D CAD model of a desktop polymer extruder that can produce filamentous feedstock for testing purposes. The proposed design includes a feed control mechanism and can make a filament with a diameter of 1.75mm.

However, the study did not examine the optimization of system parameters during extrusion. Additional studies are necessary to develop a synchronization mechanism between the extruder and the winding process to create a uniformly sized filament suitable for 3D printing. Furthermore, it is necessary to use a filament-conditioned box in case of hygroscopic extruded filaments.

Once these challenges are overcome, individuals can use FDM technology comparable to a personal computer using the proposed design for manufacturing polymer filaments with desired features using different materials at appropriate extrusion temperatures.