

ABSTRACT

This research is fully committed to the design and construction of an innovative 3D printer filament extruder that uses raw materials from plastic waste pellets, with a special focus on PLA plastic. Plastic plays a central role in many everyday equipment, but its increasing use and lack of recycling is causing serious problems regarding pollution and environmental sustainability. This extruder aims to overcome several filament production failures that often occur, such as diameter inconsistencies and suboptimal melting temperatures. Apart from that, this extruder also tries to reshape unsuccessful 3D printing objects into filaments, applying the upcycle concept to reduce piles of unused plastic waste.

The choice of PLA plastic as the main material for this extruder is based on its biodegradable and sustainable properties, with an ideal melting temperature in the range of 175-210°C. The extrusion process involves heating and pressing the plastic material in seed form, then going through a series of forming stages until it becomes a filament that can be used in a 3D printer. The success of this extruder will be reflected in its ability to process PLA plastic waste into filament with a diameter of 1.75mm according to standards for 3D printing.

This research is faced with several constraints, including economic constraints that limit the selection of components and materials, manufacturing constraints that require designs to match production needs, and sustainability constraints that look at the sustainability of materials and the potential for further development. Nevertheless, this research aims to meet essential needs, including optimal melting temperature, appropriate boost speed, and monitoring capabilities connected to a smartphone device.

Overall, the hope is that the results of this research will create a 3D printer filament extruder that is effective and efficient in recycling PLA plastic waste, making a positive contribution to reducing plastic waste, and supporting the principles of environmental sustainability.

Keywords: *Extruder Filament, 3D Printer, Plastic Waste, PLA, Recycling, Upcycle, IoT Monitoring.*