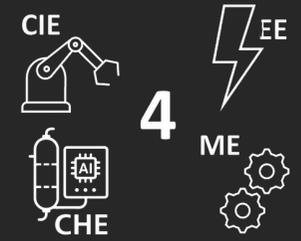


# EcoPrint: A Closed-loop Recycling System for 3D Printing Filament Production

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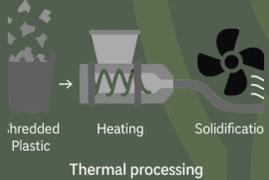
## THE 3D PRINTING WASTE PROBLEM

3D printing creates a lot of waste, up to 33% of filament is lost to failed prints and support structures. This raises costs and adds to the growing plastic pollution problem.

## OUR SOLUTION

EcoPrint is a compact, automated machine that recycles 3D print waste into fresh filament. It combines shredding, melting, cooling, and spooling.

## THERMAL PROCESSING



Shredded plastic is melted, cooled, and reformed into filament.

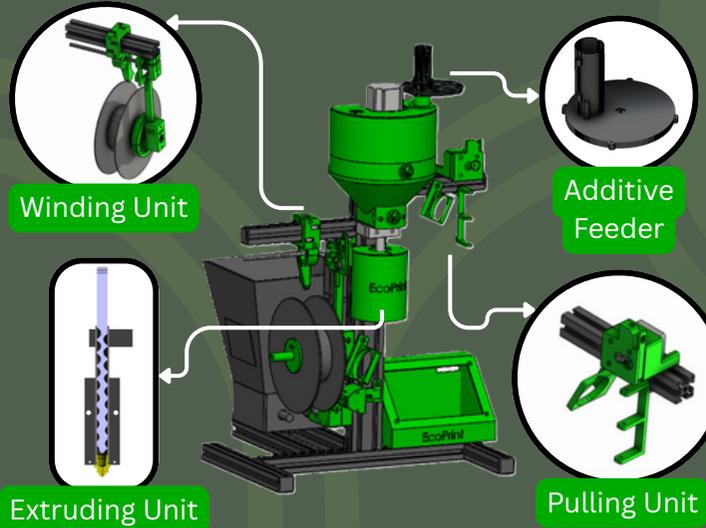
## CONSTRAINTS

- Thermal Safety:** Max temperature 300°C
- Size Limit:** 500mm x 500mm max
- Power:** 240V, 60Hz AC
- Duration:** 4 months max
- Filament Diameter:** 1.75mm

## SPECIFICATION

- Voltage Stability:** ±5% of nominal value (e.g. 240VDC, 5VDC)
- Temperature Range:** 180°C - 280°C
- Shredded Particle Size:** <15mm
- Filament Tolerance:** 1.75mm ±0.1mm
- Tensile Strength:** 30 - 100 MPa (varies by filament type)
- Production Rate:** 100-200 g/hr ±10%
- Cost Limit:** ≤ 6500 SAR
- Spool Capacity:** Up to 1kg

## SYSTEM OVERVIEW & 3D MODEL



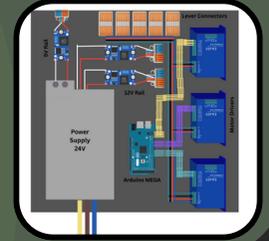
## USER INTERFACE (HMI)

A built-in system that neatly wraps the filament onto the spool automatically, ensuring even layers and saving time.

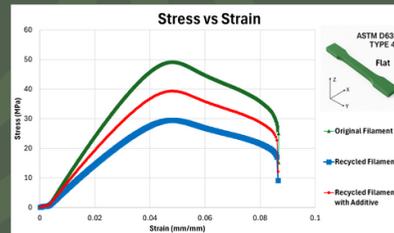


## MODULAR POWER HUB

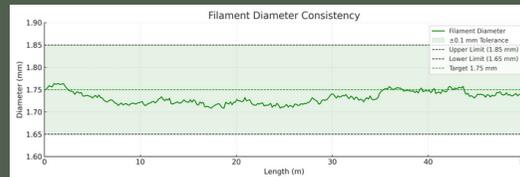
The Modular Power Hub is a compact control panel that distributes 24V power into multiple voltage rails to different components.



## TESTS & VALIDATION



Tensile Test to Evaluate Mechanical Properties



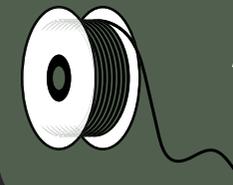
Diameter Consistency of Recycled Filament

## MATERIAL ENHANCEMENT

2.5% Wt. Charcoal additive improves thermal stability, raises molecular weight, for recycled PLA filament.



## AUTO-WINDING



Auto-winder neatly wraps filament in even, consistent layers.