

***Design of 3D Printing Filamen Making Machine Made From PET
(Polyethylene Terephthalate) Bottles Using Solar Panels as a Source of
Electrical Energy***

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ABSTRACT

Plastic waste has become a global concern due to its non-biodegradable nature and significant contribution to environmental pollution. In Indonesia, Polyethylene Terephthalate (PET) plastic bottles are one of the main contributors to national waste accumulation. To address this issue, a 3D printing filamen manufacturing machine was developed to process plastic bottle waste into 3D printing filaments using solar energy. The machine is equipped with a heating element to flatten bottles without shredding, a specialized cutter to prevent filamen breaks during cutting, and a solar panel as the primary energy source, designed with mobility to enhance ergonomics. Utilizing hybrid energy, the machine operates with a 220 Wp solar panel, a Smart Inverter Solar Home UPS850 VA, a Nema 17 motor, and a VRLA 12 V 200 Ah battery. Testing results indicate that the machine consumes 4.31 kWh of energy to produce 1 kg of filamen, requiring 25 bottles of 1500 ml or 50 bottles of 500 ml. The manufacturing process includes bottle flattening for 6 hours and 25 minutes, filamen cutting for 25 minutes, and pultrusion for 9 hours and 10 minutes, making this machine an innovative solution for environmentally friendly plastic waste management.

Keywords: 3D Printing Filamen Manufacturing Machine, Bottle Cutter, Bottle Heater, Solar Panel