

***DESIGN AND CONSTRUCTION OF A PROTOTYPE OF A ROTARY
COFFEE ROASTER BASED ON SOLAR PANEL WITH A HEATER AS A
HEATING SOURCE***

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ABSTRACT

This study aims to design and test a horizontal rotary coffee roaster prototype based on an off-grid solar power system (SPS) to reduce operational fuel costs for small industries. The research methods include design engineering, mechanical fabrication, electrical installation, and functional testing. The results showed that the machine prototype, weighing 22.98 kg, was successfully realized using a stainless steel 316 drum with a maximum capacity of 1.2 kg. The drive system utilizes a 12V 12 RPM DC gearbox motor, while the heating system uses a coil-type electric heater with dual power options (300 W/600 W) insulated with aluminum foil. The electrical system is powered by a 250 Wp solar panel set at a 15° tilt angle, a 30 A Solar Charge Controller (SCC), a battery, and a 1000 W inverter with an 81.92% conversion efficiency to supply a continuous peak load of 612 Watts. The system is also equipped with DC MCBs (20 A, 40 A, 125 A) for safety. The testing results indicate that the machine functions properly in roasting robusta coffee beans and is viable as an eco-friendly appropriate technology.

Keywords: Coffee Roaster, Rotary Drum, Solar Panel, Off-Grid, Heater.