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DESIGN OF SOLAR POWERED GRAIN MILL FOR RURAL OFF-GRID AREAS OF ETHIOPIA

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In Ethiopia most rural peoples still use hand milling methods to prepare their daily food. This takes a lot of time and is an arduous work mainly carried out by woman and children. Therefore the introduction of motorized mills can improve their living conditions. However, few rural off-grid areas of Ethiopia used diesel powered grain mill to prepare their daily food; Amasri village is one of those villages. This study aims at providing a solar energy as an alternative power source to diesel powered grain mill located in Amasri village by only replacing the diesel engine using solar PV module and also reducing the required input power of the grain mill without changing the milling capacity. The power and torque of the grain mill is determined using a tachometer which measured

the speed of the millstone. Solar powered grain mill is designed with 10 modules with 250W_p each at 2.78 kW_p, charge controller rate of 10 A, 2.2 kW DC brushless motor and the spur gear and pinion with specification of the diametral pitch of 236 teeth/meter, teeth number of 120 and 42 respectively. Environmentally, the proposed design would be expected to result is 5400 kg of annual CO₂ emission reduction. Economically, the total life time of the system is considered for 20 years. Therefore, the payback period of the proposed solar powered grain mill would be 2 years. As compare to the diesel powered grain mill, the proposed solar powered grain mill are economically and environmentally friendly.

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