Performance Analysis of the Integrated Coffee Dryer-Pulper Machine Off-Grid Solar System on the Process of Peeling and Drying Coffee Beans

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ABSTRACT

Renewable energy is a source of energy provided by nature that is very abundant and will not run out if managed properly. One of the renewable energy sources that is developing in Indonesia is solar energy. Indonesia is located in a tropical area that has very high solar energy potential, so the use of solar energy must be developed to realize clean energy. The PKM-PI Team of Jember State Polytechnic in 2024 built an Integrated Coffee Dryer-Pulper Machine Off-Grid Solar System or ICDP MOSS which aims to realize clean energy by combining a coffee fruit skin peeler (pulper) and a coffee bean dryer into one tool, using solar energy as its energy source to replace the use of gasoline. The main components of the tool are solar panels, Solar Charge Controller (SCC), batteries, DC electric motors, heaters and fans. The combination of all components must be adjusted to the power received and released which results in the efficiency of each component. The results obtained were solar panel efficiency of 18.5%, which can be used to charge a 24 V 65 Ah battery in 10.73 hours. Battery efficiency of 93% which can be used for peeling for 3.36 hours and drying for 7.25 hours. The efficiency of the DC electric motor of the peeling machine is 81.02% which is connected to the pulper so that the efficiency when peeling is 40.26%, and the efficiency of the Heater and Fan of the drying machine is 92%, so the efficiency of the drying capability is 79.16%.

Keywords: PLTS, Off-Grid, Efficiency