

***Automated Self Cleaning and Water Cooling System of a 1.1 kWp Hybrid Solar Power System at Tito Garage Workshop Jember***

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**ABSTRACT**

*Jember Regency has considerable potential for solar energy utilization in photovoltaic (PV) systems. The application of PV systems can be carried out by households and small and medium enterprises (SMEs), including Tito Garage. This business has potential for implementing a hybrid PV system. However, its environmental conditions may cause dust accumulation on solar panels. Additionally, the tropical climate with high ambient temperatures can reduce panel performance. The objective of this study is to design and implement a self-cleaning and water-cooling system based on the ESP32-DevKitC V4 microcontroller and analyze its performance. This research employs an experimental method. The first stage involves designing and developing an automated self-cleaning and cooling system integrated with solar panels. System testing was conducted by measuring panel and ambient temperatures, current electric, voltage, and solar irradiance from 09:00 to 14:00 WIB under two conditions: untreated panels and panels with a cleaning and cooling system. Data collection was conducted over two days under no-load and load conditions. The results show that the system demonstrated good performance, with an open-circuit voltage (Voc) of 1.8 V on the first day and a temperature reduction of 1.77°C. On the second day, the temperature decreased by up to 2°C and the current increased to 1 A. The efficiency of untreated panels was 17.5%, while panels with cleaning and cooling reached 18.7%. Therefore, the system shows good performance.*

*Keywords : Cooling, Cleaning, Electric Current, Irradiance, Voc*