

Design and Implementation of an Efficient Solar-Powered Pumping System

Authors : Mennatallah M. Fouad, Omar Hussein, Lamia A. Shihata

Abstract : The main problem in many rural areas is the absence of electricity and limited access to water. The novelty of this work lies in implementing a small-scale experimental setup for a solar-powered water pumping system with a battery back-up system. Cooling and cleaning of the PV panel are implemented to enhance its overall efficiency and output. Moreover, a simulation for a large scale solar-powered pumping system is performed using PVSyst software. Results of the experimental setup show that the PV system with a battery backup proved to be a feasible and viable system to operate the water pumping system. Excess water from the pumping system is used to cool and clean the PV panel and achieved an average percentage increase in the PV output by 21.8%. Simulation results have shown that the system provides adequate output to power the solar-powered system and saves 0.3 tons of CO₂ compared to conventional fossil fuels. It is recommended for hot countries to adopt this system, which would help in decreasing the dependence on the depleting fossil fuels, provide access to electricity to areas where there is no electricity supply and also provide a source of water for crop growth as well as decrease the carbon emissions.

Keywords : efficient solar pumping, PV cleaning, PV cooling, PV-operated water pump

Conference Title : ICMMS 2020 : International Conference on Micromechatronics in Mechatronic Systems

Conference Location : Amsterdam, Netherlands

Conference Dates : January 20-21, 2020