

# **Comparative Study on Photovoltaic Pumping Systems Driven by Different Motors Optimized with Sliding Mode Control**

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## **Abstract**

This study investigates the performance of three different photovoltaic (PV) water pumping systems driven by three types of motors, namely a separately excited DC motor (DCM), an asynchronous motor (ASM), and a permanent magnet synchronous motor (PMSM), via a DC/DC buck-boost converter coupled to a centrifugal pump. The purpose of this study is to implement a fast and robust control for this type of a nonlinear system, controlled by sliding mode (SM). This paper presents an SM control technique for controlling a DC/DC buck-boost converter to transfer the maximum power delivered by the PV generator. Each component is studied and analyzed to simulate the global system in MATLAB/SIMULINK. The three systems are then compared to determine the overall effectiveness of the proposed command. The study concludes that the ASM-driven PV system yields highly favorable results and requires less maintenance compared with other systems.

**Keywords:** photovoltaic generator, buck-boost converter, permanent magnet synchronous motor, centrifugal pump

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