DESIGN A DC-DC CONVERTER FOR PV CELL WATER PUMP SYSTEM

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ABSTRACT

Global warming is getting worst nowadays as the temperature is increasing. The main factor is due to the unlimited usage of non renewable energy such as burning the fossil fuel to generate electric and running vehicles. The PV cell is most effective renewable energy and the use of PV cell is important, hence solid foundations of the knowledge of voltage and current characteristics of a PV cell under certain load conditions are very important. One of the applications of PV cell is to run a dc motor in water pumping system, the reason of this idea is used because to pump water from river to the housing area is quite a distant, thus to install the electric dissipation system and wiring are very costly and difficulty. Therefore PV cell is a cost effective component, it can reduce the cost and work on wiring.

The objective of this project is to design a DC-DC converter to run a permanent magnet dc motor in water pump system using (PV cell) photovoltaic as a source. This project is to simulate the efficiency of PV cell in water pumping system. It provides theoretical studies of PV cell and modeling techniques using equivalent electric circuits and using Matlab Source Code. The simulation is able to model a PV cell in order to plot the I-V curve and P-V curve to indicate the electrical characteristic of the PV cell. Then the project also includes Matlab Simulink to verify the output voltage level of the design in DC-DC converter (Buck Chopper), then, the combination of the PV cell, DC-DC converter and permanent magnet dc motor are simulated as well. The simulation is able to plot the characteristic of torque versus speed and current of the permanent magnet dc motor. At the same time, is able to show the input and output (voltage and current) consumed by the permanent magnet dc motor. Finally, the simulated characteristics were verified using hardware measurement such as multimeter and oscilloscope. The result shows that the graph of the torque versus current in simulation and hardware measurement are exactly the same. However the efficiency in the simulation is much lower than the hardware measurement because the limitations of the measured value. In the simulated environment, the transient value is taken into consideration whereas in the measured value, only steady state is recorded.