Chapter-14

Stand Alone BLDC Motor Drive Using Solar Power

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Modern day usage of electrical energy has increased unimaginably to the extent that conventional energy sources are likely to be exhausted very soon in near future Their persistent use has led to heavy increase in environmental pollution paving way for use of renewable sources for generating electrical energy.

This chapter deals with the development of a simple, cost effective, efficient, reliable, and eco-friendly water pumping system which utilizes a DC-DC boost converter as an intermediate power conditioning unit in Solar Photovoltaic (SPV)water pumping system. The power optimization of solar photovoltaic array and limiting the starting inrush current of BLDC are the two major functions of DC-DC boost converter. The starting current is controlled without any additional circuit. The boost converter offers many privileges over other DC-DC converters in solar photovoltaic array-based applications. The voltage source inverter (VSI) utilized here performs the electronic commutation of brushless DC motor. The motor is operated with pulses of fundamental frequency hereby avoiding switching losses caused by the pulses of high frequency. Further, the speed of brushless DC motor is controlled by using a variable DC link voltage which results in absolute elimination of sensor that would have been otherwise required for speed control of the motor. The proposed solar photovoltaic array-based water pumping system is modelled, designed, and simulated in the SIMULINK environment of MATLAB and various performance indices have been analysed under practical conditions, thereby, confirming its suitability and credibility for water pumping purposes.

Though solar power extraction systems are prevalent, there is a need to develop low cost and highly efficient systems. Most common existing system makes use of two stage converters present between the PV array and the grid/load. The first converter is a DC-DC boost converter meant to increase the low DC voltage coming from the PV array. This boosted DC voltage is then fed to an inverter for converting the DC into AC at a desired voltage level. This system, however, is costly due to the presence of the two converters and absence of a common input source for the two stages resulting in asymmetrical operation. The large size, weight and low reliability also contribute to the

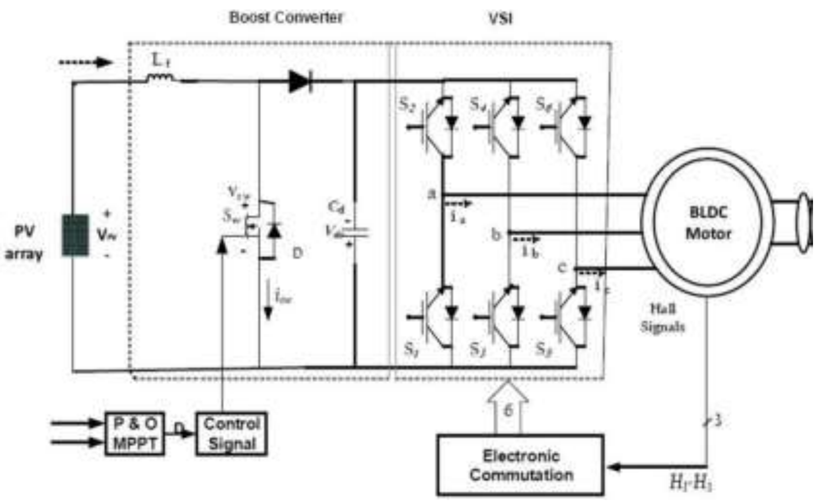

Fig 2: Circuit Diagram

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