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BLDC Motor-Driven Solar PV System Through MPPT

B. Anand Swaroop[1], P. Narendra[2], D.Nagasathish[2], R.Nagendra[2], S.Mohan Kireeti[2], M.Anandarao[2]

[1]Assistant Professor, Dept of EEE, Avanthi Institute of Engineering and Technology, Vizianagaram
[2]UG Student, Dept of EEE, Avanthi Institute of Engineering and Technology, Vizianagaram

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ABSTRACT

The drastic reduction in the cost of power electronic devices and annihilation of fossil fuels in near future invite to use the solar photovoltaic (SPV) generated electrical energy for various applications as far as possible. The water pumping, a standalone application of the SPV array-generated electricity, is receiving wide attention nowadays for irrigation in the fields, household applications, and industrial use. SPV array-fed water pumping, combining various dc–dc converters and motor drives, the zeta converter in association with a permanent-magnet brushless dc (BLDC) motor is not explored precisely so far to develop such kind of system. However, the zeta converter has been used in some other SPV-based applications. The advantages and desirable features of both zeta converter and BLDC motor drive contribute to develop a simple, efficient, cost-effective, and reliable water pumping system based on solar PV energy.

KEY WORDS: BLDC motor, PV System, Zeta Converter and PWM based VSI.

1. INTRODUCTION

A BLDC Motor or Electronically Commutated Motor (ECM) are synchronous motor which are supplied by Direct Current (DC) through Inverter or Switching Power Supply producing AC through which each phase of the motor can be driven. Brushless motor are similar to permanent magnet synchronous motor in terms of construction but it can also be transformed into a switched reluctance motor. BLDC motors find numerous applications in the field of industrial engineering, consumer appliances, electric vehicles, motion control system, positioning and actuation system's aero modeling and many more [1]. BLDC motor has number of advantages over other motors which include high power-to-weight ratio, better speed, electronically controllable, reliable operation and require less maintenance [2].

Brushless motors typically have rotating permanent magnets and a fixed armature, which eliminates the challenges associated with supplying current to the moving armature. The brush/commutators unit of the brushed DC motor is replaced by an electronic controller, which continuously shifts the phase to the windings to keep the motor moving. Instead of the brush/commutators scheme, the controller uses a solid-state circuit to conduct similar timed power distribution [2]. In the no-load and low-load regions of the motor's performance curve, the increased efficiency is greatest. Brushless motors and high-quality brushed motors are comparable in efficiency under high mechanical loads. Environments and requirements in