

Implementation of Solar Powered BLDC Motor Drive Using Cuk Sepic Converter

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Abstract- The DC connection voltage between the PV and the VSI is managed by way of the Cuk converter. The CCM is used in the Cuk converter to manipulate the DC bus voltage, which enables to reduce DC-DC converter losses. The BLDC motor's pace is regulated with the aid of a voltage supply inverter with PWM manage. The Hall Effect sensor is used to generate the PWM pulse.

I. INTRODUCTION

In isolated places in which energy transmission is not possible or uneconomical, solar-powered water pumps are becoming an increasing number of popular. Solar strength is likewise nonpolluting, ample in nature, and costless, amongst different matters. As a result, sun electricity can be used to replace most people of traditional power assets. Water pumping systems can be powered by using a solar-powered AC and DC device. On low speeds, the AC automobiles have com-plea manipulate and lower efficiency. Brushes and commutation issues with the DC motor necessitate everyday maintenance. PMSBLDC for water pumping systems is recommended in a study, together with numerous MPPT tactics. The PMSM is likewise advised for use in a water pumping gadget. The SRM, which has a quick reaction time, extraordinary torque, and an extensive working velocity range, has additionally been advocated. BLDC motors, on the other hand, have a whole lot of blessings. Many home packages, hybrid cars, robots, and different packages have been carried out. Brushes and a commentator segment aren't present in a BLDC motor. As a result, brush put on and tear in addition to sparking issues are no longer a difficulty. For strength element correction, a cascaded dollar-improve converter fed BLDC motor pressure turned into highlighted in a study..

II. TRADITIONAL TOPOLOGIGIES

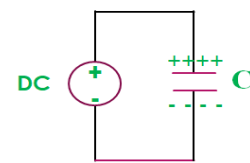
The CUK produces terrible output, whereas the SEPIC produces high quality output. When comparing the SEPIC-CUK association, each

converter has the identical voltage conversion ratio but contrary polarity. Two wires, one with high quality polarity and the other with negative polarity, make up a bipolar DC hyperlink.

III. Voltage source inverter (VSI)

The input voltage of a voltage supply inverter (VSI) is stored steady. VSI is powered with the aid of a DC voltage source with a low or no impedance.

To create a VSI, we connected a DC supply in parallel with a huge capacitor that maintained a consistent input voltage. In the case of VSI, the output voltage is unaffected by the burden. The load modern's waveform, in addition to its magnitude, is decided through the kind of the load.



VSI

Fig 1: voltage source inverter

IV. CURRENT SOURCE INVERTER (CSI)

The input cutting-edge of a cutting-edge supply inverter (CSI) is saved consistent. A DC voltage source with high impedance feeds CSI with an adjustable current supply.

By adding a huge collection inductance that continues the enter current regular, VSI may be transformed to CSI. The output present day in CSI is unaffected by the weight. The significance of the output voltage and its waveform are decided through the load impedance.

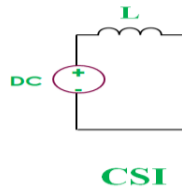


Fig 2 : current source inverter

V. SEPIC CONVERTER

Two inductors, link capacitors, a transfer, and a diode make up traditional SEPIC and CUK converters. The CUK produces bad output, while the SEPIC produces wonderful output. When evaluating the SEPIC-CUK association, each converters have the same voltage conversion ratio however opposite polarity. Two wires, one with advantageous polarity and the other with negative polarity, make up a bipolar DC link. The present day thru floor is 0 in everyday operation. It functions voltage degrees, allowing for monopole functioning in fault settings. The counseled configuration's key gain is that it enables for the creation of a bipolar DC hyperlink with handiest one controlled switch. The generation is well suited with both AC and DC micro grids. MPPT set of rules with linear variable structure manipulate.

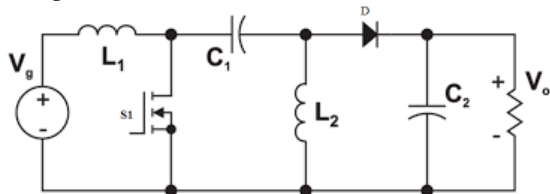


Fig 3 : sepic converter circuit diagram

6.1 Advantages

High productivity. Simple. There is not any transformer. Operation at a excessive frequency Regulator loop is easy to stabilize..

6.2 Disadvantages

There is no separation among the enter and output. If Q1 is short, you will need a crowbar. The ripple modern-day in C1 is pretty excessive. It is tough to attain the cutting-edge limit. There is simply one viable output..

VI. PROPOSED CIRCUIT DESCRIPTION

The sun-powered Cuk converter for water pumping structures is based on a three-segment voltage supply inverter (VSI) supplied BLDC motor. To

alleviate voltage and contemporary traces on its switching devices, the Cuk converter is designed to run in continuous conduction mode (CCM). In the Cuk and voltage supply inverter, the MOSFET (IRFP840) is used as a switch (VSI). In addition, the CCM observed that the DC-DC conversion is unaffected by using the weight. Discontinuous conduction mode (DCM) generates electromagnetic interference noise and raises switching losses. As an end result, via the usage of the CCM mode, these flaws are eliminated. According to the, the PWM pulses are generated using a Hall Effect sensor located at the shaft.

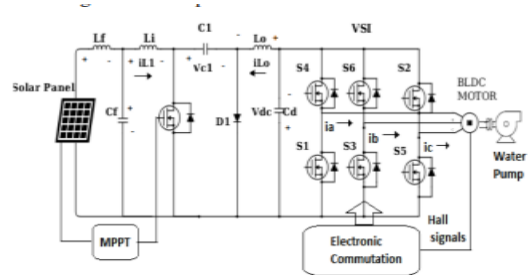


Fig 4 : Solar-fed BLDC motor with Cuk converter suggested circuit schematic for water pumping system

7.1 OPERATION AND CONTROL OF PROPOSED SYSTEM

In this circuit, fuzzy common sense MPPT is utilised to get the maximum electricity out of the solar panel, and PWM control is used to adjust the voltage supply inverter, which controls the rate of the BLDC motor that pumps the water...

7.2 MPPT FOR SOLAR POWER SYSTEM

Solar electricity is inherently intermittent. To get the most electricity out of a sun panel, numerous techniques are used. In these paintings, a fuzzy good judgment controller is used to get the maximum energy out of a sun panel. The MPPT controller uses these records to tune the most power generated through changing sun intensities

7.3 CCM OPERATION OF CUK CONVERTER

When the transfer (SW) is closed, the input inductor (Li) saves power, at the same time as the intermittent capacitor (C1) discharges it through Cd, and the output inductor (Lo) stores it. 2) The input inductor (Li) discharges its power via C1 whilst the transfer (SW) is open. Meanwhile, the strength stored inside the output inductor (Lo) is discharged to Cd. As a result, by choosing huge values for the input inductor (Li), output inductor (Lo), and intermittent capacitor (C1), some strength is continually on hand for continuous operation during switching intervals

7.4 Use of BLDC

(1) A 2.5 kW motor with a rated speed of 3000 RPM is used. (2) The output electricity and body size are both big. Because the rotor is product of permanent magnets, it is able to be made smaller for a given output electricity. (Four) The inertia of the rotor is 0.00045 kg/m². This permits for stepped forward dynamic qualities. (5) The starting present day has been determined. There is not any want for a separate starter circuit. It is not important to start slowly.

VII. RESULTS

The BLDC motor's PWM switching reduces switching losses even as enhancing performance. Conclusions: This circuit's prototype version changed into additionally created, and its overall performance features were confirmed. By the usage of a Cuk converter, switching losses are decreased. By working in one hundred twenty-degree conduction mode, the VSI became capable of lessen switching losses. Hall signals correctly alter the velocity of the BLDC motor...

VIII. FUTURE SCOPE

The project work could be expanded to include sensed BLDC motor operation using hall sensors.

CONCLUSION

The circuit's prototype model may be constructed, and its performance functions may be verified. By using a Cuk converter, switching losses are reduced. By running in 120-diploma conduction mode, the VSI was able to reduce switching losses. Hall indicators efficaciously regulate the speed of the BLDC motor. The price of the circuits is correctly reduced and overall efficiency is extended by means of casting off the alternative kind of regulating sensors.

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