Switched Capacitor Voltage Boost Converter For Electric Drives

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Abstract- *Using 12v battery the dc-dc Boost converter is working and it boosts up the voltage. Here we are using the Sepic converter, it doubles the input voltage as output voltage. There will be no ripple in the voltage. By programming the microcontroller the MOSFET driver circuits are operated and also turning ON and OFF are done by programming. The boosted output voltage and current are viewed using LCD display.In the existing system permanent magnet brushless DC motor is replacing single phase induction motor used in air conditioners for driving compressor and fan for its low power utilization. BLDCMs are fed from a single-phase AC main through a diode bridge rectifier (DBR) and a smoothening DC link capacitor, which results in a pulsed current from AC mains having various power quality (PQ) disturbances such as poor power factor (PF), increased total harmonic distortion (THD) harmonics which reduces the power quality and causes unwanted electromagnetic interference. BLDC motors have the drawback of higher torque ripple.*

Keywords- BLDCM, LCD Display, Sepic converter, Micro controller.

I. INTRODUCTION

After Among many electrical motors, Brushless DC motor is very efficient low power appliances. It is suitable for many applications because of its ruggedness, high torque, high efficiency, low electromagnetic interference problems. Various applications including industrial tools, heating ventilation and air conditioning, medical equipment, and robotics use this type of motor for better outcome. To achieve power factor, close to unity at AC supply PFR converters are used. PFC converter driven BLDC motor drives are used. Primarily used converters are PFC-based Cuk, single ended primary inductance converter, Zeta converter are used in the PFR regulation. In proposed system Landsman converter is used for the same purpose. In a brushless DC motor stator is made up of three-phase intense windings and rotor has permanent magnets. With the presence of Hall-effect positioning sensor a threeleg voltage source inverter (VSI) is used for electronic commutation of BLDCM. Hence, major problems with brushes and commutator are eliminated.

A typical BLDCM drive usually consists of a diode bridge rectifier (DBR) with DC bus capacitor followed by a VSI. The six solid-state switches ofVSI is driven by three-phase pulse-width modulation (PWM) signals which feeds the BLDCM. With AC supply to achieve power factor close to unity PF regulation (PFR) converters are embedded followed by a DBR. It acts as a significant factor as it affects the rating of passive elements of converter. PFC converter based on boost configuration has emerged as popular configuration for driving a brushless DC motor. In such schemes a constant DC-Link voltage is maintained at DC bus capacitor of VSI.

II. LITERATURE SURVEY

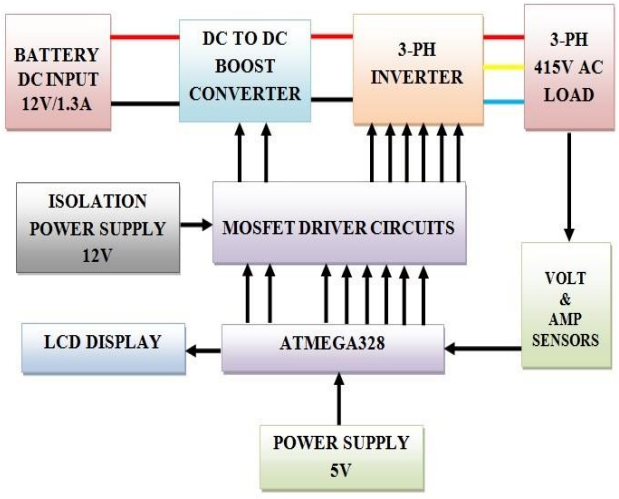
Shanmugasundram, R., K. Muhammad Zakariah, and N. Yadaiah."Implementation and performance analysis of digital controllers for brushless DC motor drives." IEEE/ASME transactions on mechatronics 19, no. 1(2014): 213-224.This paper presents design and digital implementation of a fuzzy controller for achieving improved performance of Brushless dc (BLDC) servomotor drive. The performance of fuzzy and PID controller-based BLDC servomotor drives is investigated under different operating conditions such as change in reference speed, parameter variations, load disturbance, etc. BLDC servomotors are used in aerospace, instrumentation systems, space vehicles, electric vehicles, robotics, and industrial control applications. In such applications, conventional controllers like P, PI, and PID are being used with the BLDC servomotor drive control systems to achieve satisfactory transient and steady state responses. However, the major problem associated with the conventional PID controller is that the tuned gain parameters obtained for such BLDC servomotor drive control systems do not yield better transient and steady-state responses under different operating conditions such as parameter variations, load disturbances, etc. In this paper, designand implementation of fuzzy controller is presented and its performance is compared with PID controller to show its capability to track the error and usefulness of fuzzy controller in control applications.

III. METHODOLOGY

In proposed system, a newly modified SEPIC converter is used to boost the voltage .Which is used to enhance the voltage gain by preserving the conventional characteristics of SEPIC converter.Modified SEPIC converter is helps to minimize the voltage drop.In the system, the input 230V power supply is given to the modifiedSEPIC converter and then output is higher than the input voltage . AT Mega 328 microcontroller is used in this system for Turn ON and Turn OFF the MOSFET drives by programming the microcontroller.

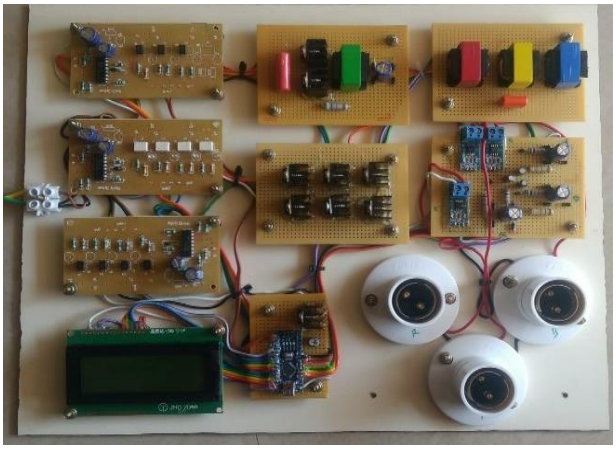
The following are the components for designing,

- DC Battery
- DC to DC boost converter
- 3- PHASE inverter
- Power supply 12v
- MOSFET driver circuits
- LCD display
- ATMEGA 328
- Voltage and Current sensor



IV. HARDWARE DESCRIPTION

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1).



ASoftware Serial‘ library allows for serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus; see the documentation for details. For SPI communication, use the SPI library.

V. RESULTS AND CONCLUSION

This paper has presented a new switched-capacitor power converter (SC) for implementing dc-ac and ac-dc power conversion. The SC converter employs a switched-capacitor circuit augmented with the main converter circuit to the power source, thus providing unique features that cannot be attained by the traditional VSI or boost VSI. One of these unique features is doubling the area of the linear modulation region. The SC converter eliminates the need for the cumbersome and costly inductor to boost the voltage. Instead, it relies on only the capacitors to achieve voltage boost, which allows higher powerdensity. The formulation of the maximum voltage drop across the capacitor and the minimum charging current are analytically derived. The analytical results provide a clear insight into the design elements that affect the behavior of the charging current, thus allowing the operation at higher power. The SC converter can boost or buck voltage, minimize component count, increase power density, and reduce cost.

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