

Microcontroller Based Buck Boost Converter

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Abstract: Pakistan's Energy infrastructure is not well developed, rather it is considered to be underdeveloped and poorly managed. Currently the country is facing severe energy crisis. Despite of strong economic growth and rising energy demand during past decade, no serious efforts have been made to install new capacity of generation. The use of various power sources like generators, UPS, solar system with DC power lines and DC loads as well as with UPSs for their requirements is most common in the country. Nowadays the most common system is DC loads with batteries and solar chargers. The basic drawback of DC system is the voltage regulation for DC home appliances, whenever batteries are fully charged the light intensity of lamps and speed of fans increased and may also damage appliance. While decrease in battery decreased the light intensity of lamps and speed of fans. For this problem a system automatic voltage regulator for DC appliance based on Arduino has been made. It is based on buck boost converter technology, when battery fully charged this does not allow excessive voltage to loads and maintain the desired voltage, when voltage of battery decreased the system increases the voltage to desired level.

Keywords: Solar Plates, Inverters, Arduino, Switch, Buck Boost, Appliances.

1. Introduction

The use of automatic voltage regulator is wide and they are mostly used in the homes and offices [1-2]. They are usually used to stable the voltage in order to secure the appliances from the high voltage [3]. But these stabilizer are usually AC voltage stabilizers and that's why we made DC stabilizer that can stabilize the DC voltage [4-6]. These stabilizers are used in the solar plates [7]. The solar plates gives DC voltage to battery and battery supplies power but voltage is unstable [8-9] and thus sometime gives more power to the appliances and sometime gives less power to appliances so when we use the DC voltage stabilizer then this stabilizes the voltage [10-12].

The main objective of this project design is to stable the DC voltages that are supplied from the solar plates. In order to stable the voltage there are many options but microcontroller based buck boost converter is most reliable easily manageable and cost effective way to stable the DC voltage,

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2. Methodology

The system is developed using the Arduino UNO microcontroller with buck boost converter. A buck converter is a switch mode DC to DC converter in which the output voltage can be transformed to a level less than or greater than the input voltage. The magnitude of output voltage depends on the duty cycle of the switch.

3. Hardware Description

The hardware part consists of Arduino UNO, LCD, Operational amplifier, potentiometers, diode transistors, inductors.

Arduino UNO: The Arduino UNO is an open-source microcontroller board depending on the Microchip Atmega328P microcontroller and created by Arduino.cc. Arduino receives commands sent by the user according to programming code. It can be controlled by a USB link or by an outside 9-volt battery; however, it acknowledges voltages between 7 and 20 volts.



Fig. 1 – Arduino UNO Board

Operational Amplifier: The LM158 series consists of two independent, high gain, internally frequency compensated operational amplifier which were designed specifically to operate from single power supply over a wide range of voltages.



Fig. 2 – LM158 IC

LCD display module: LCD (liquid crystal display) screen is an electronic display module and find a wide range of applications. A 20x4 LCD display is very basic module and is very commonly used in various devices and circuits. LCDs are economical and easily programmable.



Fig. 3 – LCD 20x4

4. Result And Discussions

When the battery is fully charged the developed system prevent the excess voltage to the load using buck boost converter with Arduino PWM technique and when battery voltages are low than the desired voltage level the system increases the voltage for the load. The accuracy of developed system is good.

5. CONCLUSION

A voltage stabilizer is a device designed to reduce the variations in voltage of the supply to some other apparatus. Interest in buck boost inverters has grown notably with development of sustainable energy system in recent years. Energy fluctuates dramatically with weather and season conditions whereas a buck boost converter is used to stable the dc power. For this we have developed a system using Arduino with buck boost to stable the dc voltage when the voltage is increased or decreased form a desired level.

6. Future Recommendation

Buck operation can be performed in the zeta converter by reducing the modulation index. Some other techniques also can be applied to reduce the total harmonic distortion and higher frequency switching can be achieved.

7. References

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