



Power Generation From Pressure And Amplified Using Ky Converter

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ABSTRACT

Without harming the environment it's necessary to focus more on renewable energy and unconventional sources for electricity generation. The hump mechanism which consists of the permanent magnet dc generator ,is used to obtain pressure which in turn is connected to the piezoelectric sensor and these two systems have been coupled with each other and stored in the battery and thus it is fed as the input to the KY converter where the given input voltage is uplifted. The KY converter has continuous input and out inductor currents, and features a larger voltage conversion ratio with ripple free voltage.

Keywords PMDC GENERATOR, PIC CONTROLLER,KY CONVERTER,PIEZOELECTRIC SENSOR

1. INTRODUCTION

The increasing globalization and industrialization has caused a continuous increase in energy demand. This energy demand can be cope up by employing new and renewable energy resources and doing their integration with grid. In order to meet the future electricity demand without harming the environment, it is necessary to focus more on renewable energy and unconventional sources for electricity generation. Nowadays energy recovery is considered the most efficient strategies to reduce the financial and environmental drawbacks of the excessive utilization of fossil fuel. Hence the proposed system uses the renewable energy sources which can be easily available and eco-friendly.

Recently several researchers have focused on the conversion of pressure into electrical energy by using the piezoelectric element since they thought that the presence of waste vibration energy might have some values to be used. And hence as a result they used compression floors which will absorb the pressure and can be converted into electricity. On the other hand ,other set of researchers came to the idea that the electricity can also be generated from the speed breakers when the vehicles move across the speed breakers by compression and expansion mechanism .

So from the combined idea of several papers the proposed project is modified in such a

way that by combining the piezoelectric sensor which absorb the useful vibration and also the PMDC generator which converts the mechanical energy into electrical energy can be coupled together and also the use of voltage uplifting converter (i.e) the KY converter amplified and ripple free output voltage can be obtained. For the application of the power supply using the low voltage battery, analog circuits, such as RF amplifier, audio amplifier, etc., often need high voltage to obtain enough output power and voltage amplitude.

This is done by uplifting the low voltage to the required high voltage. Thus, traditional non-isolated voltage-boosting converter, such as the boost converter and the buck– boost converter, their output currents are pulsating, thereby, producing the ripple output voltage. Thus, in order to produce a ripple free output voltage, the KY converter is used and the power is generated.

2. HUMP MECHANISM

The hump mechanism is the process involving compression and expansion when the pressure is applied. The spring attached to the PMDC generator facilitates this action, and converts the mechanical energy into electrical energy. The same mechanism is used in speed breakers to generate the electricity where the gear mechanism attached to the hump facilitates the electromagnetic transducer resulting in the conversion of mechanical energy into electric energy.

PMDC GENERATOR

A DC generator is an energy converter that turns mechanical energy into electrical. This change in the form of energy happens based on the principle of electromagnetic induction which means wherever a change in the magnetic flux happens associated with a conductor, an EMF or an electromagnetic force is induced in it. DC generator operates on the principle of the dynamically induced electromagnetic force. When a conductor is placed in a varying magnetic field, an electromotive force gets induced within the conductor. If the conductor is provided with a closed path, the induced current will circulate within the closed path. In this generator, field coils will generate an electromagnetic field as well as the armature conductors are turned into the field. Therefore, an electromagnetically induced electromotive force (e.m.f) will be generated within the armature conductors.

PIEZOELECTRIC SENSOR

The Piezoelectric Sensor requires no external voltage or current source, they are able to generate an output signal from the strain applied. A piezoelectric sensor converts physical parameters - for example, acceleration, strain or pressure into an electrical charge which can then be measured. They are highly sensitive and very small in size making them well suited to everyday objects. Piezoelectric sensors are strong, lightweight and constructed of flexible plastic enabling them to be available in a range of sizes, shapes and thicknesses. The piezoelectric sensor have high strength and high

voltage output enabling them to be used for various application . they are used in burglar alarm , musical instruments and for machine monitoring

KY CONVERTER

The KY converter is a step up DC- DC converter it works on Continuous conduction mode and thus, the current through the inductor never goes to zero which means inductor partially discharges before the start of the switching cycle. The boost converters uses diode for the voltage upliftment but in case of KY converter the diode is replaced by a MOSFET to develop the efficiency and to reduce the conduction losses.

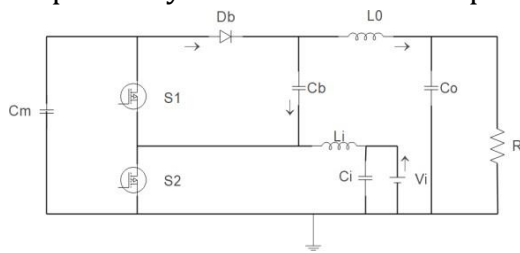


Fig 2.3 CIRCUIT DIAGRAM OF KY CONVETREER

The KY converter operates in two modes.

MODE 1 :

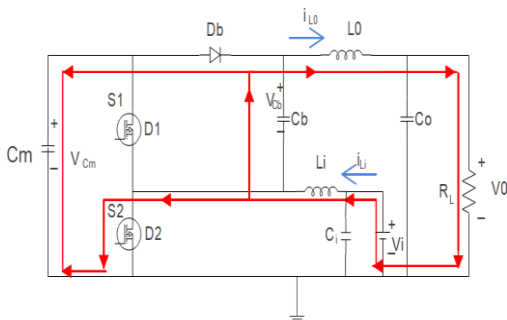


fig 2.3.1 MODE 1 OPERATION OF KY CONVERTER

In fig 2.3.1, the input voltage V_{in} is given to the KY converter making the MOSFET S2 to turned on .The capacitor C_b is charged and pulled to the ground making the diode D forward biased. The voltage across the inductor L_i is V_i hence making the inductor L_i to be magnetized and the inductor L_o is demagnetized.

MODE 2 :

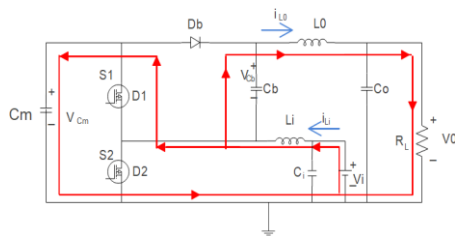


Fig 2.3.2 MODE2 OPERATION OF KY CONVERTER

In fig 2.3.2, the MOSFET S1 is turned on and the capacitor Cm is charged and also the capacitor Cb is discharged making the diode reverse biased. The inductor Lo is magnetized and the inductor Li is demagnetized. The voltage across Lo is difference between the total voltage flowing through the capacitors Cm and Cb

PIC MICROCONTROLLER -16F877A

The PIC 16f877A microcontroller is used to give the input switch pulse to the KY converter in the proposed project. One of the main advantages is that it can be write-erase as many times as possible because it uses FLASH memory technology which is EPROM. It has a total number of 40 pins and there are 33 pins for input and output, shown in fig 2.4.

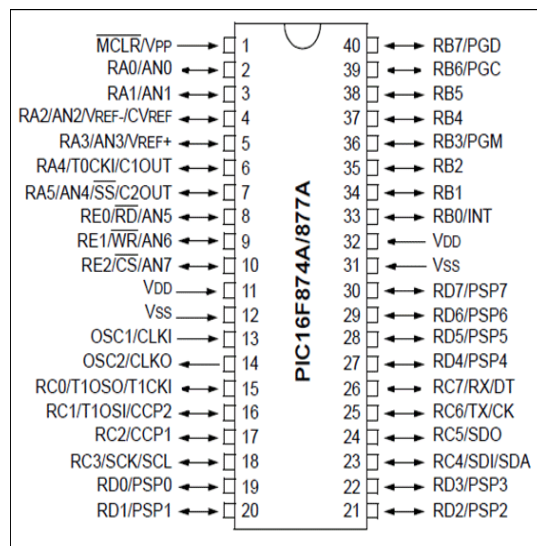


Fig 2.4. PIN DIAGRAM-PIC (16F877A)

3 .SIMULATION

The simulation used for the proposed project is MATLAB which depicts the application of pressure to the PMDC generator, the output from the generator is given to the KY

converter through the NOT gate which will make only one of the

MOSFET among the two to turn on at a time .

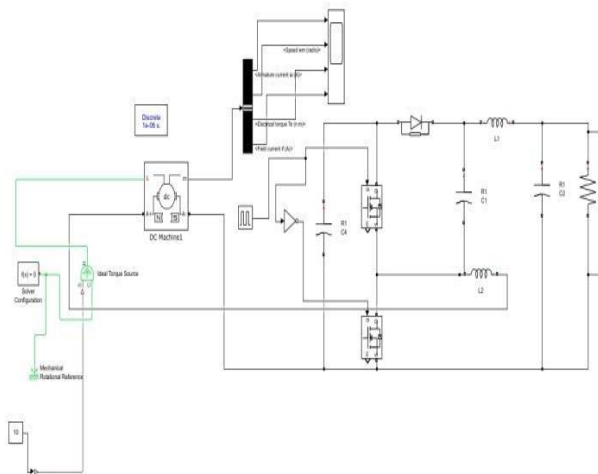


Fig 3.SIMULINK DIAGRAM

In the fig.3,the MOSFET S2 is turned ON The capacitor Cb is charged and pulled to the ground making the diode D forward biased. The voltage across the inductor L2 is V_i hence making the inductor L2 to be magnetized and the inductor L1 is demagnetized.

The MOSFET S1 is turned on and the capacitor Cm is charged and also the capacitor Cb is discharged making the diode reverse biased. The inductor L1 is magnetized and the inductor Li is demagnetized . The voltage across Lo is difference between the total voltage flowing through the capacitors Cm and Cb.

Hence as a result when the load is connected to the converter and checked for the uplifted voltage it is more than twice the given input voltage .

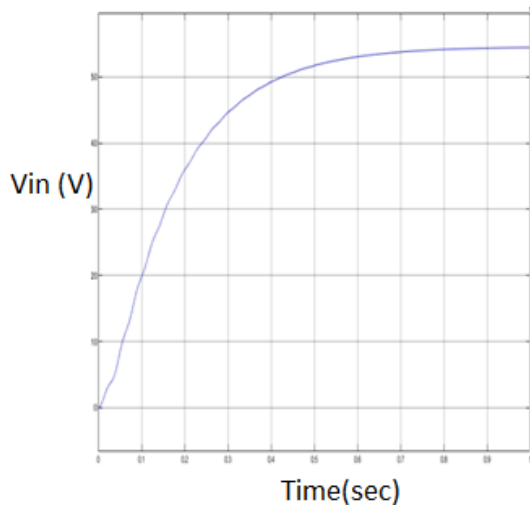


Fig 3a. Input voltage

The fig.3a, represents the voltage before the upliftment ,(i.e.) when the pressure is applied to the PMDC generator and piezoelectric sensor. The range of input voltage is around 55V

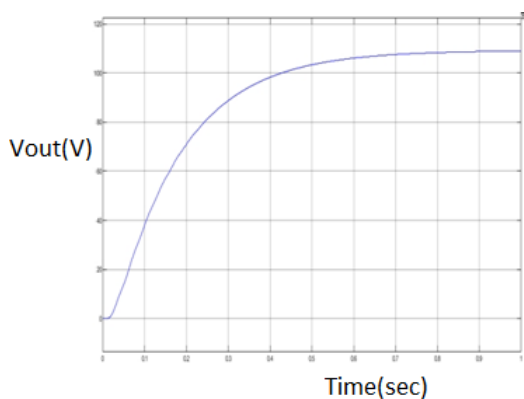


Fig 3b. Output Voltage

The fig 3b,represents the output voltage from the KY converter which is in the range 110V.

4. HARDWARE IMPLEMENTAION

The mechanical pressure which is applied to the PMDC motor and the vibration that exists in the surrounding is absorbed by the piezoelectric sensor or pressure can be separately applied to the piezoelectric sensor is stored in the battery . The input pulse to the KY

converter is given through the 16F877A PIC microcontroller.

In addition to that the pic microcontroller also has the bridge rectifier which will tend to give only the positive sequence of the sine wave ,thus, eliminating the negative sequence , apart from that it also has capacitors to produce the ripple free output voltage and also the oscillator to maintain the input frequency .

The driver circuit act as a controlling medium between the KY converter and the microcontroller. The output from the PMDC motor which in turn is stored in the battery is connected to the KY converter where the voltage is uplifted and finally connected to the inverter and the load.

HARDWARE RESULT

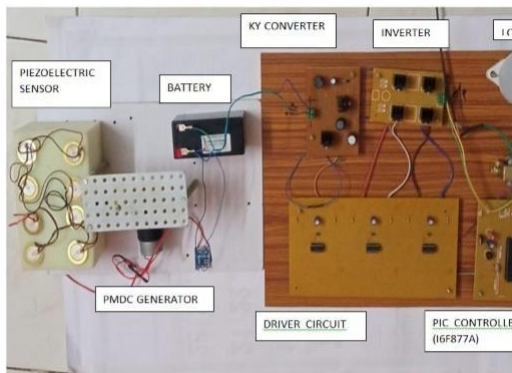


Fig4.1a. BEFORE PRESSURE IS APPLIED

The fig 4.1a. represents the PMDC generator and the piezoelectric sensor , which is incorporated with each other to apply mechanical pressure. The electrical output is stored in the battery and given to the KY converter for uplifting the voltage.

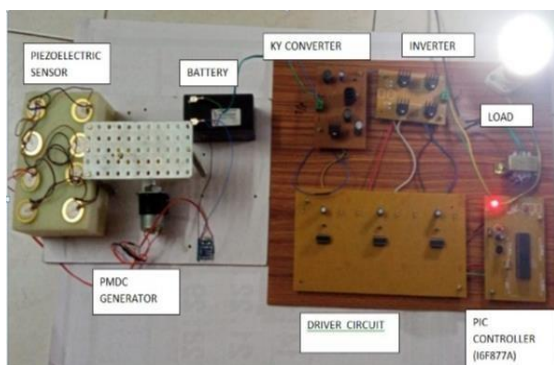


Fig.4.1b. AFTER PRESSURE IS APPLIED

In fig 4.1b the mechanical pressure is applied to the PMDC generator and piezoelectric sensor , the converted electrical energy is stored in the battery. The input

pulse to the KY converter is given by the PIC microcontroller which in turn is controlled by driver circuit and the uplifted voltage is converted into ac by inverter and given to the load.

5. CONCLUSION

The feasibility to convert the mechanical energy to electrical energy by incorporating the piezoelectric sensor and PMDC generator. In addition to that the KY converter gives uplifted and comparatively ripple free output voltage

.When the input voltage 55V is given to the converter the uplifted output voltage from the KY converter will be around 110V.The proposed project will be more effectively implemented within the budget and thereby reducing pressure on conventional power use and current generation.

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