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Generation of Electricity Using Pizo- Electric Sensor through Speed Breaker

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Abstract: ***In the present scenario power becomes major need for human life. Due to day-to-day increase in population and lessen of the conventional sources, it becomes necessary that we must depend on non-conventional sources for power generation. While moving, the vehicles possess some kinetic energy and it is being wasted. This kinetic energy can be utilized to produce power by using a special arrangement called "POWER HUMP". The Kinetic energy of moving vehicles can be converted into electrical energy through piezo electric senor. This piezo electric senor is connected to the battery and it produces electrical energy proportional to traffic density. This generated power can be regulated by using Zener diode for continuous supply. All this mechanism can be housed under the dome like speed breaker, which is called hump.***

Keywords: Power Hump , Zener diode ,Battery , PIC 16F877A Microcontroller and LDR .

1. Introduction

In the present scenario power becomes the major need for human life . The availability and its per capita consumptions are regarded as the index of national standard of living in the present day civilization. Energy is an important input in all the sectors of any countries economy. Energy crisis is due to two reasons, firstly the population of the world has been increased rapidly and secondly standard of living of human beings has increased. India is the country, which majorly suffers with lack of sufficient power generation.

The availability of regular conventional fossil fuels will be the main sources for power generation, but there is a fear that they will get exhausted eventually by the next few decades. Therefore, we have to investigate some approximate, alternative, new sources for the power generation, which is not depleted by the very few years. Another major problem, which is becoming the exiting topic for today is the pollution. It suffers all the living organisms of all kinds as on the land, in aqua and in air. Power stations and automobiles are the major pollution producing places.

Therefore, we have to investigate other types of renewable sources, which produce electricity without using any commercial fossil fuels, which is not producing any harmful products. There are already is existing such systems using renewable energy such as solar wind), OTEC (ocean thermal energy conversions) etc…for power generation. The latest technology which is used to generate the power by such renewable energy" POWER HUMP".

2. Existing System

Electricity is one of the major requirements in our day to day life. So to full fill that requirement we want to generate some energy so that it can produce some amount of electricity, so as to glow the street light .

The energy has been wasted when the vehicle passed through the speed breaker. When vehicle pass over speed breaker , kinetic energy is converted into mechanical energy using piezo electric sensor.

Drawbacks

- Small amount of carbon emission is possible in renewable source like solar.
- Large space is required.
- Investment cost is high.
- Renewable energy source depends on environment factors.

3. Proposed System

In the proposed system the power is generated from the small renewable energy source. Here we are using Pic16F877A, piezo sensor, LCD, led array and driver circuit. The piezo sensor is placed in the pavements. Here we are using piezo sensor. It is made up of piezo electricity effect. If the any human is present on the pavements it generates some power. This power is amplified and used for some small power applications. If the power is required power (obtained from ADC) controller actuate the driver circuit and give power to the load without any disturbance. LDR is used to detect the current condition that is day time or night time. During night only LED will glow.

Hardware Used

- Pic16f877a Microcontroller with Power Supply.
- PIEZO pressure sensor .
- LCD.
- Driver circuit.
- Battery.
- LDR sensor.
- LED array.

Software Used

- MP lab micro vision
- Embedded C

Power Supply for PIC 16F877A Microcontroller

The power supply section is the important one. It should deliver constant output regulated power supply for successful working of the project. A 0-12V/1 mA transformer is used for this purpose. The primary of this transformer is connected in to main supply through on/off

switch& fuse for protecting from overload and short circuit protection. The secondary is connected to the diodes to convert 12V AC to 12V DC voltage. And filtered by the capacitors, Which is further regulated to +5v, by using IC 7805.

Introduction of PIC16F877A

The PIC16F877A CMOS FLASH-based 8-bit microcontroller is upward compatible with the PIC16C5x, PIC12Cxxx and PIC16C7x devices. It features 200 ns instruction execution, 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/ compare/ PWM functions, a synchronous serial port that can be configured as either 3-wire SPI or 2-wire I2C bus, a USART, and a Parallel Slave Port.

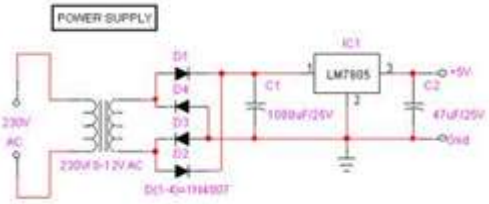

Figure 1: PIC Diagram

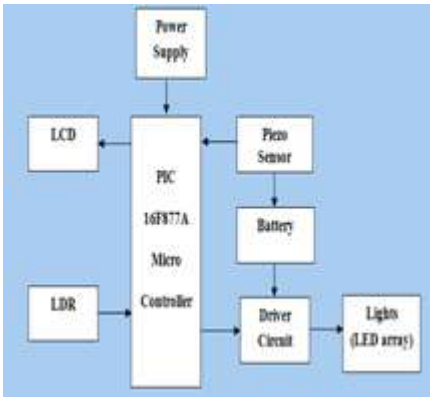

Figure 2: Block Diagram

Piezo Pressure Sensor

Piezoelectric Pressure Sensors measure dynamic pressures. They are generally not suited for static pressure measurements. Dynamic pressure measurements including turbulence, blast, ballistics and engine combustion under varying conditions may require sensors with special capabilities. Fast response, ruggedness, high stiffness, extended ranges, and the ability to also measure quasi-static pressures are standard features associated with PCB quartz pressure sensors.

Charge mode pressure sensors generate a high-impedance charge output. ICP® (Integrated Circuit Piezoelectric) voltage mode-type sensors feature built-in microelectronic amplifiers, which convert the high-impedance charge into a low-impedance voltage output. (ICP is a registered trademark of PCB Piezotronics.)

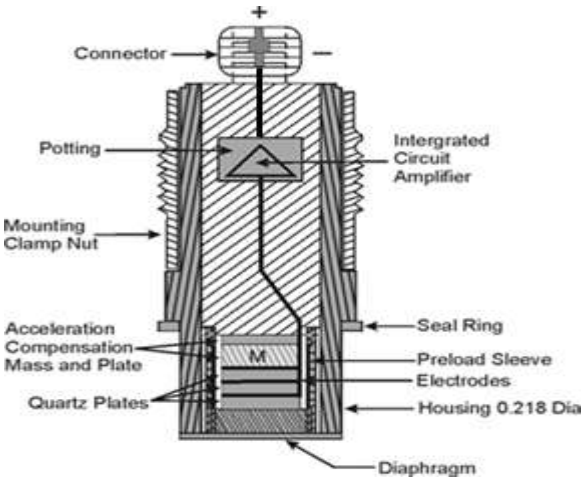

Figure 3: Piezo Pressure Sensor

Light Dependent Resistor

A **Light Dependent Resistor** (photoconductor, or photocell) is a device which has a resistance which varies according to the amount of light falling on its surface.

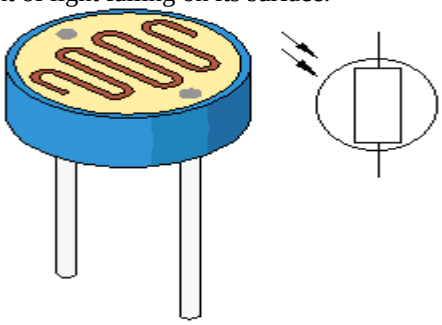

Figure 4: Light Dependent Resistor

Light dependent resistors are a vital component in any electric circuit which is to be turned on and off automatically according to the level of ambient light - for example, solar powered garden lights, and night security lighting.

An LDR can even be used in a simple remote control circuit using the backlight of a mobile phone to turn on a device - call the mobile from anywhere in the world, it lights up the LDR, and lighting (or a garden sprinkler) can be turned on remotely.

Light Dependent Resistor Circuits

There are two basic circuits using **light dependent resistors** - the first is activated by darkness, the second is activated by light. The two circuits are very similar and just require an **LDR**, some standard resistors, a variable resistor (potentiometer), and any small signal transistor.

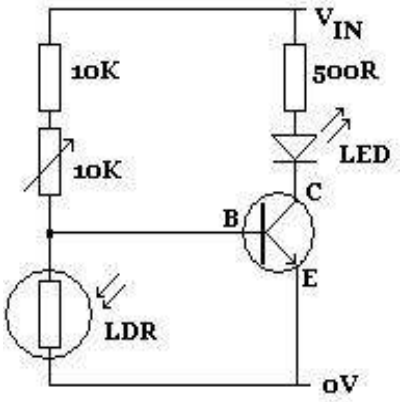

Figure 5(a): Circuit Diagram of LED

In the circuit diagram above, the LED lights up whenever the LDR is in darkness. The 10K variable resistor is used to fine-tune the level of darkness required before the LED lights up. The 10K standard resistor can be changed as required to achieve the desired effect, although any replacement must be at least 1K to protect the transistor from being damaged by excessive current.

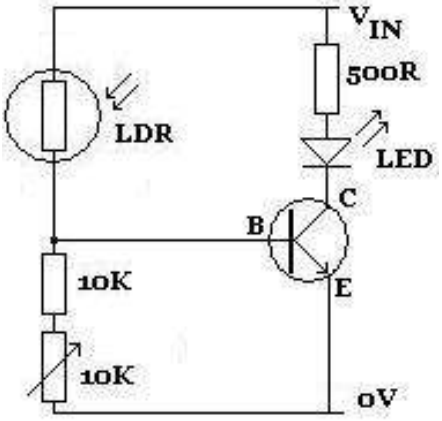

Figure 5(b): Circuit Diagram of LED

By swapping the LDR over with the 10K and 10K variable resistors (as shown above), the circuit will be activated instead by light. Whenever sufficient light falls on the LDR (manually fine-tuned using the 10K variable resistor), the LED will light up.

Using an LDR in the Real World

The circuits shown above are not practically useful. In a real world circuit, the LED (and resistor) between the positive voltage input (Vin) and the collector (C) of the transistor would be replaced with the device to be powered.

Typically a relay is used - particularly when the low voltage light detecting circuit is used to switch on (or off) a 240V mains powered device. When darkness falls (if the LDR circuit is configured that way around), the relay is triggered and the 240V device - for example a security light - switches on.

Battery

A battery, which is actually an electric cell, is a device that produces electricity from a chemical reaction. Strictly speaking, a battery consists of two or more cells connected in series or parallel, but the term is generally used for a single cell. A cell consists of a negative electrode; an electrolyte, which conducts ions; a separator, also an ion conductor; and a positive electrode. The electrolyte may be aqueous (composed of water) or non-aqueous (not composed of water), in liquid, paste, or solid form. When the cell is connected to an external load, or device to be powered, the negative electrode supplies a current of electrons that flow through the load and are accepted by the positive electrode. When the external load is removed the reaction ceases.A primary battery is one that can convert its chemicals into electricity only once and then must be discarded. A secondary battery has electrodes that can be reconstituted by passing electricity back through it; also called a storage or rechargeable battery, it can be reused many times.

4. Result Analysis

As far as the experiment concern, we have two related observation with regard to voltage generated to the variation in speed and load. The following were the illustration:

Let us consider the load (heavier vehicle) is constant on the speed breaker. Now we have the voltage produced , to the variation in the speed of the vehicle. If the vehicle run slowly then it certainly applies the pressure on the speed breaker for a long time so the voltage produced will be most in this case. While we keep on increasing the speed, the vehicle rushes over the speed breaker, the pressure keep on decreasing so as voltage produced.

Let us consider the speed vehicle is kept constant on the speed breaker. Now we have the voltage produced to the variation to the load applied in the speed breaker. Assume if the vehicles runs over it has least load capacity compare to others then it certainly applies a very less pressure that result in a least voltage produced. Now as the load keep on increasing ,the voltage produced also kept increasing because the pressure on breaker keeps increases with the load .

Figure 6: General Diagram of KIT

CASE 1: When the light intensity is low then relay of LED will glow.

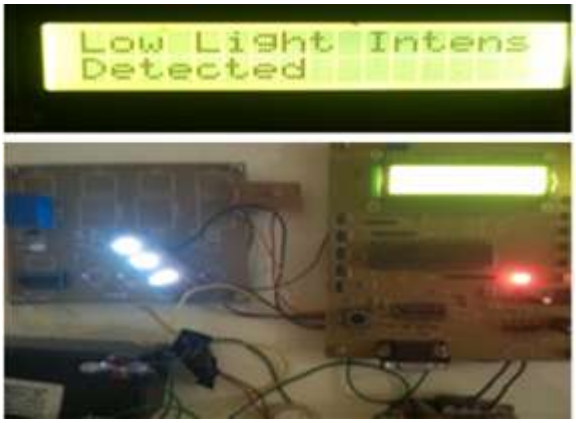

Figure 7: Light intensity is low then relay of LED will glow

CASE 2: When the light intensity is high on LDR then relay of LED will not glow and energy has been stored in battery.

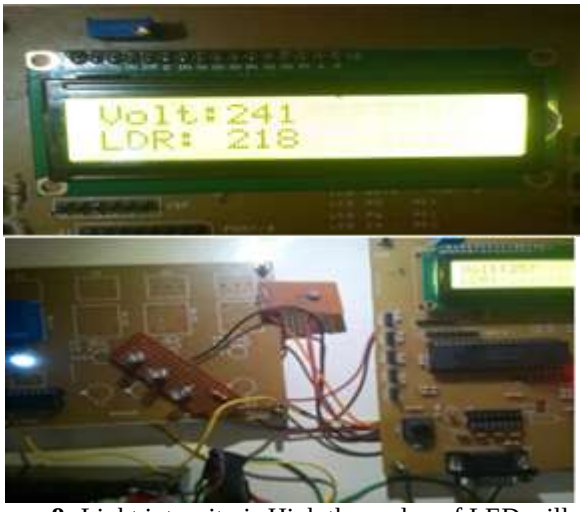

Figure 8: Light intensity is High then relay of LED will not glow

Advantages

- ECO friendly.
- Independent on environmental factors.
- Compact size.
- Less no. of hardware is required.

5. Conclusion

In coming days, this will prove a great boon to the world , a since it will prove great boom to the world, since it will save a lot of electricity of power plant that gets wasted in illuminating the street light. As the conventional source are depleting very fast, then it's time to think of alternative. We got to save the power gained from the conventional source for efficient use. So this idea not only provide alternative but also add to the economy of the country. Now vehicular traffic in big cities is more, causing a problem to the human being. But this vehicular traffic can be utilized for power generation by mean of new technique called "power hump". It has advantage that it does not utilize any external source [5]. Now the time has come to put forte these types of innovation idea, and researches should be done to upgrade their implication.

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