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Hybrid Charger

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Abstract: *The electrical energy plays an important role in human life. The generation and distribution of electrical energy is a big task and it involves so many procedures. The countries like India is facing scarcityof electrical energy due to the non availability of sources like water and others. So it is required to think the methods to generate electricity from other ways to meet the dialy needs. The wastage of energy should be avoided and suitable methods should be implemented for the conversion of such energy into useful form. Renewable energy is the energy which is obtained from renewable sources such as sunlight, wind, pressure, tides etc/-. Elecricity is produced from sunlight using solar panels. This sun's energy is captured using photovoltaic cells in the solar panel elecricity system. These cells don't need direct sunlight to work-they can still generate some electricity on a cloudy day. Piezoelecric effect is the ability of certain material to generate an electic charage in response to applied mechanical stress. This paper is concentrated on three effective conversion method to convert the energy formed due to mechanical stress. Mechanical system , piezoelectric crystal , and solar panel are the three methods, and they are placed in a single module. The electricity produced using this method can be used to charge the mobile phones and other purposes.*

Keywords: *Renewable sources of energy, Pedalling mechanism ,Piezo electric crystal, Solar panel.*

I. Introduction

World is a storehouse of energy. According to law of conservation of energy, energy can niether be created nor be destroyed but can be transformed from one form to another form. But we are wasting lots of resources which can produce energy as if they are limitless. For a solution of scarcity of energy, which is the major threat of world, we have to renew and reuse the energy which we are wasting. Renewable energy is the energy that collected from the sources like wind, sunlight, tides, pressure etc/- Renewable energy is energy that comes. From sources that replenish themselves over short periods of time. The solar panel electricity systems, also known as solar photovoltaic's(PV), capture the sun's energy using photovoltaic cells. These cells don't need direct sunlight to generate electricity they can still generate some electricity on a cloudy day. When the sunrays hits a cell, the photons are converted to electrons of direct current(DC) electricity that flow through an inverter where they are then transformed in to an alternating current (AC) power. Piezo electric effect is the ability of certain materials to generate an electric charge in response to applied mechanical stress. Piezoelectric materials are materials that can create electricity when subjected to a mechanical stress. They will also work in reverse, generating a strain by the application of an electric field. This paper is concentrated on three effective energy conversion methods to convert the energy formed due to mechanical stress. Mechanical system method, piezo electric crystal method and solar array method are the three methods and they are placed in a single module. The electricity produced using this method can be used to charge the mobile phones and other purposes.

II. Literature Review

1. Electrified India

In reference to the report[1] , number of towns and villages electrified in India by IIFL, it can be seen that even after 65 years of independence 17.7 percentage of Indians is still in the dark. However, in India villages are more than towns. Out of 593732 villages in India only 488439 villages are electrified. i.e 105293 villages are unelectrified. In the state Jharkhand where only 31.1% villages are electrified. The consumption of electricity in the country is increasing day to day. There is increasing in the consumption but there is no any proportional increase in the production of electricity. When this situation still going in the country there will be worst conditions like load shedding and increase in the prices. So it is necessary to think alternative methods in

order to meet the daily needs of the energy consumption. The energy which is wasting is to be conserved and it should be transformed into useful form.

2. Turing fun into watts

In the July 2011 [2] issue of IEEE Spectrum, a detailed study and analysis of the pedal power energy generation, its usage, feasibility, and economics is presented. The power is produced from the exercise bike used in gyms by means of a small generator. This article presents a case where in it looks at the overall feasibility of including the pedal power technology. Using the cycle pedaling mechanism we are generating electricity. The pedaling mechanism is applying to the rides which is using in the children's park. So the fun is getting by the children is converting to electricity. The energy wasted is getting converted into efficient energy which is capable to charge mobile phones and other electronics equipments. And also children's also feel sudden changes in the blood pressure when they use the slider rides. When children's use the slider rides they directly strike on the ground, this will generate changes in the blood pressure which may causes some health problems. By introducing this system in the children's park this problem can be avoided.

3. Power generations using pedaling mechanism

There are various renewable energy sources such as solar, wind, hydropower, tides etc/-. In addition, people use fossil fuels, which are non- renewable. These resources are very expensive. Therefore, there is need for cheap, renewable energy source. The human energy can be converted into electricity. One of the system that convert the human energy into electricity is the pedaling mechanism. Pedal which is used in the bicycles when attached to a dynamo it can generate electricity. Now a days there are so many equipments which is working using the current produced from the bicycle pedal mechanism. Power generation using pedaling mechanism is very cheap and eco-friendly. Today dynamo equipped bicycles are common which power the fluorescent bulbs. The rotational energy that is generated when the tire rotates because of the application of force on the pedals can be used in two ways. This energy can be used in dynamo/alternator, which is then converted to electrical energy. In pedal powered washing machine, the plastic barrel rotates as we pedal. Thus, water consumption can be also reduced. Using exercise bikes also power can be generated. Particularly for people living in cities, it is an added advantage that no separate time is needed and along with exercise our effort will not go waste. So by considering the above application of the pedaling mechanism this paper is concentrated to generate the electricity using the rides which is used in the children's park.

III. Methodology

1. Existing systems

As the people in the world is over the continue search for the renewable energy sources, innovative and interesting ideas for generating power are constantly being devised. As a result there are various methods to convert non conventional energy into electricity. Many of the techniques used for the electricity generation is from the renewable sources. There are methods under which converts the energy from where the wastage of the same is taking place such as electricity is being generated from bicycle. Bicycle is using most of the common people for their daily travel. The energy which is using for riding the bicycle can be converted in to electricity.

2. Bicycle pedal powered laptops

Laptops powered using solar energy is available in the present markets, but it will not be affordable to everyone to buy it because of its cost. The cost of solar equipped devices is very high. A similar system is exists in Afghanistan that it use pedal power to charge the laptops. Here the pedal is fitted to the laptop table so that while using the laptop one could charge it.

3. Bicycle pedal powered washing machine

Bicycle pedal power can be used to operate washing machine. It agitates, cleans and rinses the clothes. Already existing modes uses pedal power in two different ways. In one of the model, plastic barrel filled with water, soap powered and cloths are put and lid is closed. This plastic barrel itself is rotated by pedaling. In the other model also plastic barrel is used. But one person can sit on that barrel and pedal the foot pedal provided at the bottom of the plastic barrel.

4. Proposed system

In this proposed system the electricity is generated using the rides. This technique is used in children's park, for converting the pressure induced during the use of zezo and slider into electric energy, cycle pedalling technique is the most suitable method to convert a small pressure in to electric energy. It provide rotation only in one direction, so acting on panel, the panel will move downwards. The movement of panel will make rotation in

pedal. The pedal is connected with wheel through a chain. So when the pedal starts to rotate, it will rotate the wheel also. The motor is connected with the wheel through a belt, so when the wheel rotate it also produce a rotation in motor shaft. After one cycle of movement of pedal it will reach its previous position with the help of spring. During the time when the park is not opened or the absence of the use age of the rides the solar panel connected with the pedal will generate the electric energy for lighting the lamps. The electric energy is stored by using a rechargeable battery. In rainy season water may get inside the casing and it damages the motor. In order to avoid that, a water collecting pipe is connected with the casing.

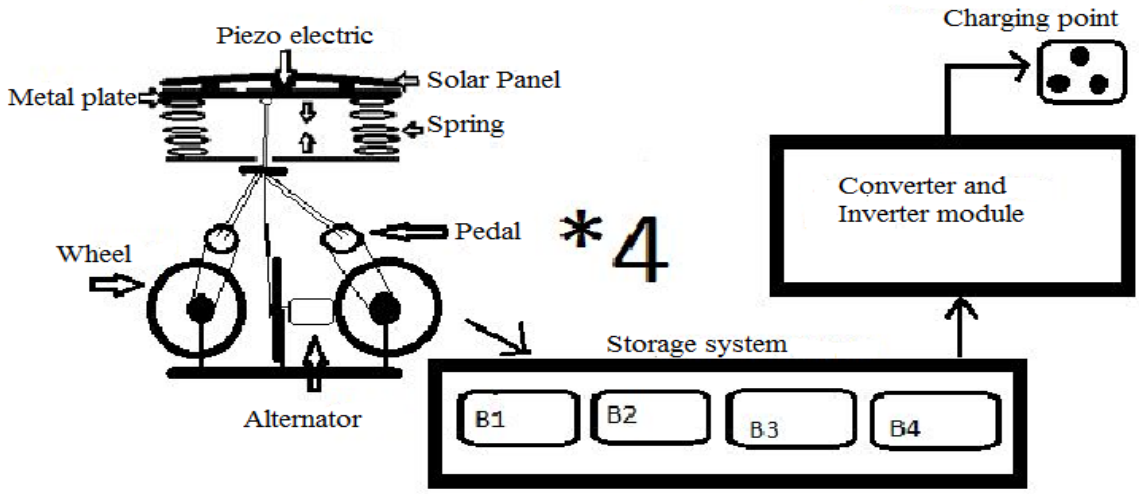

Fig 1 Block diagram of the system

5. Mechanical system

A pedal and wheel mechanism are the parts of mechanical system. The stress acting on the metal plate create a downward motion in pedal, when it moves downwards the wheels start to rotate. The generator shaft is directly coupled to the wheel, so the shaft of the machine start to rotate. The return path of pedal is provided by the help of spring mechanism. The return path of pedal does not create any disturbance in machine rotation.

6. Solar system

Solar system is used to generate electricity in an absence of mechanical stress and is provided on the top of the energy conversion module. When the light strikes on panel electron flow will occur and it is stored in battery.

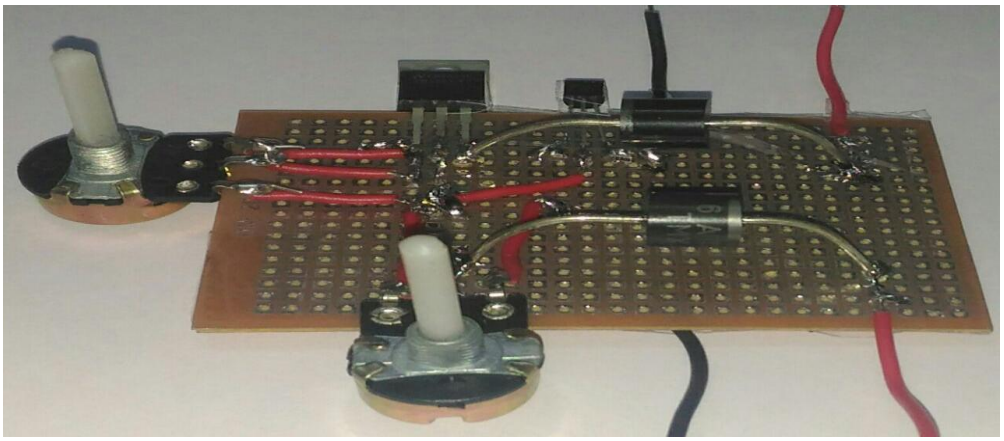

Fig 2. Solar battery charger circuit.

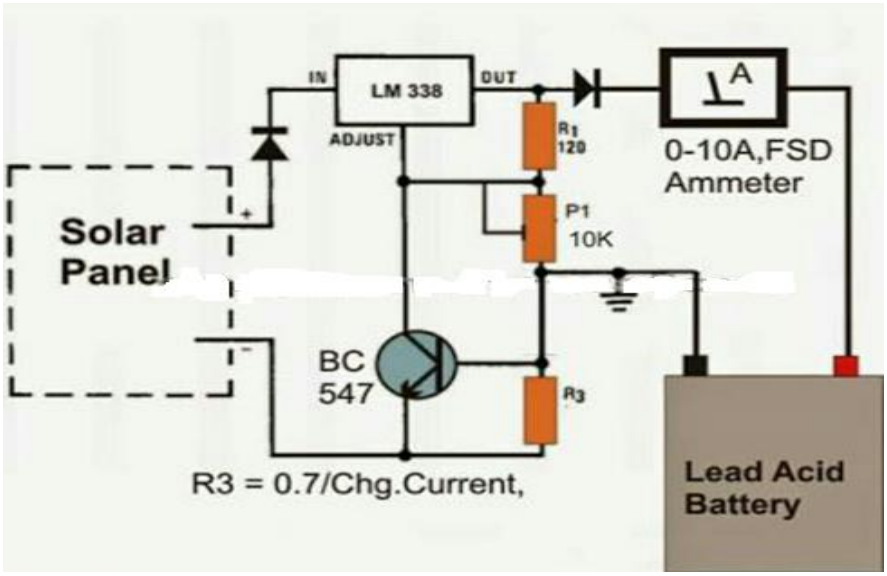

Fig 3 Solar battery charger conversion circuit

7. Piezo electric system

Piezoelectric materials are materials that can create electricity when subjected to a mechanical stress. They will also work in reverse, generating a strain by the application of an electric field. The phenomenon was first discovered in 1880 when Pierre and Jacques Curie demonstrated that when specially prepared crystals (such as quartz, topaz and Rochelle salt) were subjected to a mechanical stress they could measure a surface charge. A year later, Gabriel Lippmann deduced from thermodynamics that they would also exhibit a strain in an applied electric field. One of the first applications of the piezoelectric effect was an ultrasonic submarine detector developed during the First World War. A mosaic of thin quartz crystals glued between two steel plates acted as a transducer that resonated at 50MHz. By submerging the device and applying a voltage they succeeded in emitting a high frequency 'chirp' underwater, which enabled them to measure the depth by timing the return echo. This was the basis for sonar and the development encouraged other applications using piezoelectric devices both resonating and non-resonating such as microphones, signal filters and ultrasonic transducers. However many devices were not commercially viable due to the limited performance of the materials at the time. Piezo electric material which convert stress acting on the surface in to electrical energy which is placed between solar system and metal plate for effective conversion of pressure.

8. Converting system

The conversion system includes MOSFETs which converts the produced dc is converted into ac. This ac current is used to charge the mobile phones and also used for other purposes. Here we use the an inverter section for the converting the dc to ac.

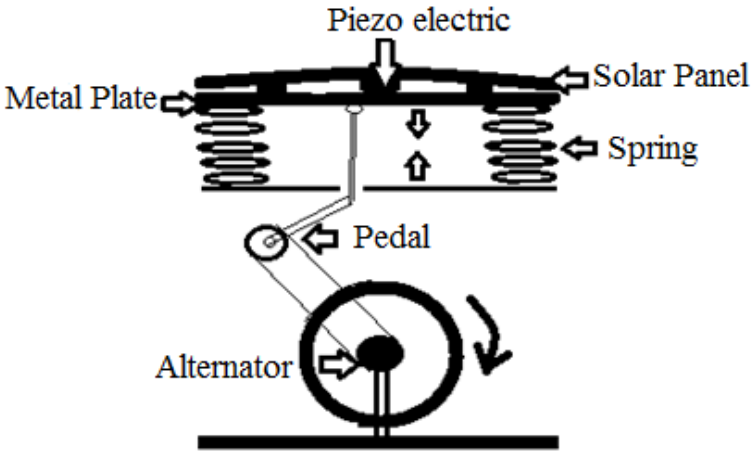

Fig 4 Pedalling mechanism

9. Inverter section

Power inverter, or inverter, is an electronic device or circuitry that changes direct current (DC) ,the alternating current (AC). The input voltage, output voltage and frequency, and overall power handling depend on the design of the specific device or circuitry. The inverter does not produce any power; the power is provided by the DC source. A power inverter can be entirely electronic or may be a combination of mechanical effects (such as a rotary apparatus) and electronic circuitry. Static inverters do not use moving parts in the conversion process. A typical power inverter device or circuit requires a relatively stable DC power source capable of supplying enough current for the intended power demands of the system. The input voltage depends on the design and purpose of the inverter.

Inverters can also be used with transformers to change a certain dc input voltage into a completely different ac output voltage but the output power must always be less than the input power. In our project we are using the buck boost inverter circuit. The buck-boost converter is a type of dc to dc converter that has an output voltage magnitude that is either greater than or less than the input voltage magnitude. It is equivalent to a fly back converter using a single inductor instead of a transformer. Two different topologies are called buck boost converter both of them can produce a range of output voltages, ranging from much larger than the input voltage, down to almost zero. The output voltage is of the opposite polarity than the input. This is a switched mode power supply with a similar circuit topology to the boost converter and the buck converter. The output voltage is adjustable based on the duty cycle of the switching transistor. One possible drawback of this converter is that the switch does not have a terminal at ground. This complicates the driving circuit. However, this drawback is of no consequence if the power supply is isolated from the load circuit because the supply and the diode polarity can be simply be reversed. When they can be reversed the switch can be either be reversed ground side or the supply side. The output voltage is typically of the same polarity of the input, and can be lower or higher than the input. Such a non inverting buck boost converter may use a single inverter which is used for both the buck inductor mode, using switches instead of diodes, sometimes called a "four switch buck boost converter", it may use multiple inductors but only a single switch.

Inverters are often needed at places where it is not possible to get AC supply from the Mains. An Inverter circuits is used to convert the DC power to AC power. Inverters can be of two types True/pure sine wave inverters and quasi or modified inverters. These true/pure sine wave inverters are costly, while modified or quasi inverters are inexpensive. these modified inverters produce a square wave and these are not used to power delicate electronic equipments. Here, a simple voltage driven inverter circuit using power transistors as switching devices is built, which converts 12V dc signal to single phase 220V AC

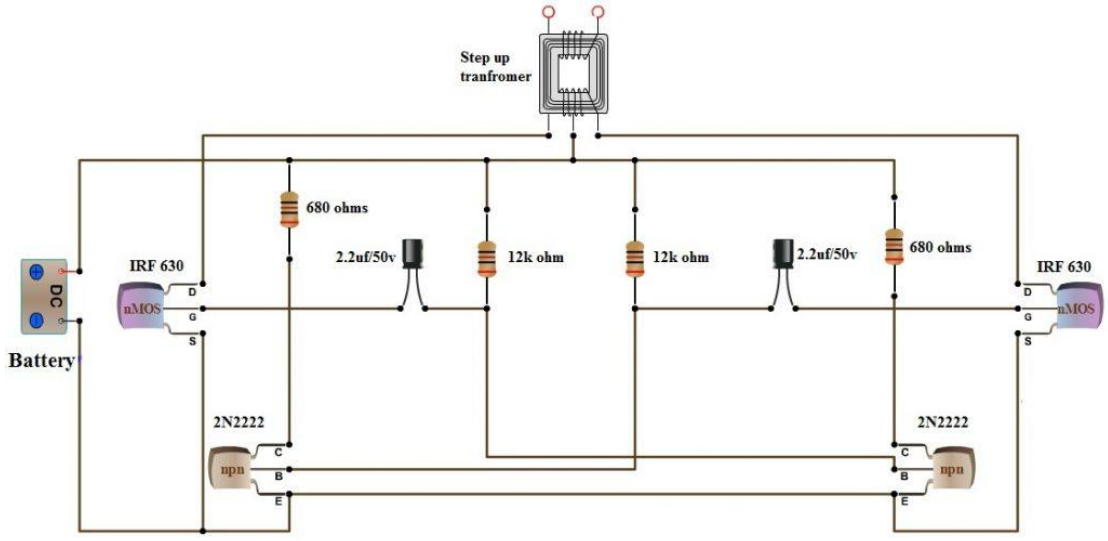

Fig 5 Inverter circuit

The basic idea behind every inverter circuit is to produce oscillations using the given DC and apply these oscillations across the primary of the transformer by amplifying the current. This primary voltage is then stepped up to a higher voltage depending upon the number of turns in primary and secondary coils. A 12V DC to 220V AC converter can also be designed using simple transistors. It can be made to drive more powerful loads by adding more MOSFETS. The inverter implemented in this circuit is a square wave inverter and works with devices that do not require pure sine wave AC. The working of this circuit is, the circuit can be divided into three parts: oscillator, amplifier and transformer. A 50Hz oscillator is required as the frequency of AC supply is

50Hz. This can be achieved by constructing an Astable multivibrator which produces a square wave at 50Hz. In the circuit four resistors(R1,R2,R3,R4), two capacitors(C1,C2) and two transistors(T1,T2) forms the oscillator. Each transistor produces inverting square waves. The values of resistors and capacitors will decide the frequency. The formula for the frequency generation by the astable multivibrator is

$$F=1/(1.38*R1*C1) \quad (1)$$

The inverting signals from the oscillator are amplified by the power MOSFET T1 and T2. These amplified signals are given to the step-up transformer with its center tap connected to 12V DC. The turns ratio of the transformer must be 1:19 in order to convert 12V to 220V. The transformer combines both the inverting signals to generate a 220V alternating square wave output . By using a 24V battery, loads up to 85W can be powered, but the design is inefficient. In order to increase the capacity of the inverter, the number of MOSFETS must be increased.

10. Alternator design

10.1 Volt to rpm ratio

In the mechanical system the speed will varies due to the effect of stress acting on the metal plate. In this project we expect the alternator will rotate at 1000 RPM. Voltage generated per revolution is 0.012V. Voltage generated when the ,alternator rotate at 1000 RPM will be,

(1000 rpm)* (0.012V/rpm) = 12 V

The efficiency of generator is not 100% , and it will be 80 to 85 % efficient.

Therefore, 0.8* 12 V = 9.6 V

10.2 Amperage ratio

The next item is the amperage rating of the alternator. This provides information regarding how much current the alternator will put out as a generator. From our experience, it is very difficult to predict what type of current your alternator will put out as a generator. We've seen alternator that expel more amps than that for which they are rated. However, one thing remains true: The higher the amperage rating, the better. You should be looking for a alternator with a minimum amperage rating of at least 5 Amps. Anything above 5 Amps and you are good to go.

The power that a wind generator produces is directly proportional to the amps and voltage: In fact, Power = Volts x Amper Keep it simple: Only purchase a permanent magnet motor. Look for minimum Volts to RPM ratio of 0.01. Our requirement is a minimum amperage rating of 5

11. Simulation

11.1 6V solar panel

From the 6V solar panel it will not get 6V voltage output from the early morning. In order to charge the 12V battery it is a voltage more than 12V is necessary, which is not obtained from the solar panel. So in order to charge the battery a buck boost converter is placed after the solar panel. The buck boost converter will give a 12V output voltage in order to charge the battery.

11.2 12V Alternator

The mechanical input given to the alternator is depends upon the rpm of the pedal. So there will not be sufficient rpm to the 12V alternator to generate the sufficient current. The battery requires 12V to charge. So after rectification of the alternator output it is connected to the buck boost circuit. The buck boost circuit will boost the input given to it and thus sufficient current will be given to the battery and the battery will charge.

11.3 Parallel circuit

The alternator and the solar panel outputs are paralled and it is given to the battery. Thus the battery will get sufficient current in order to get charged.

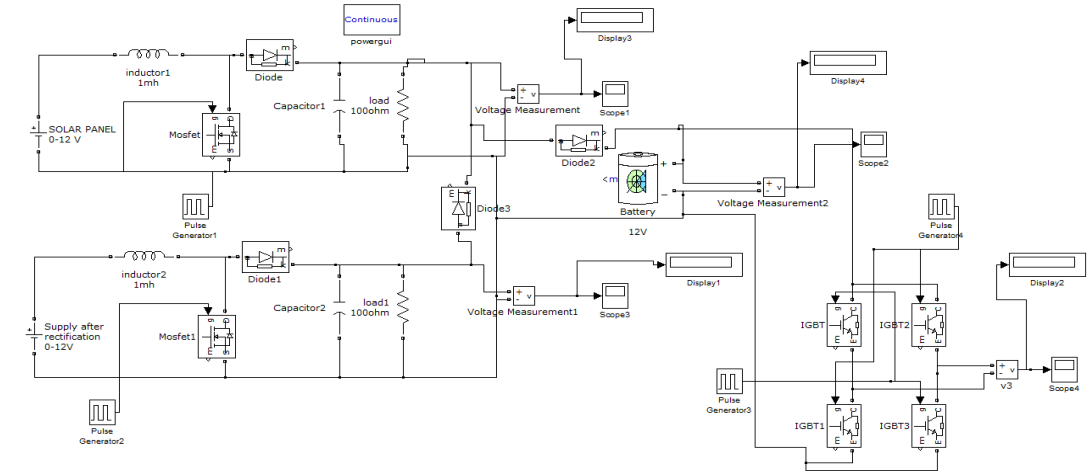

Fig 6 Simulation diagram

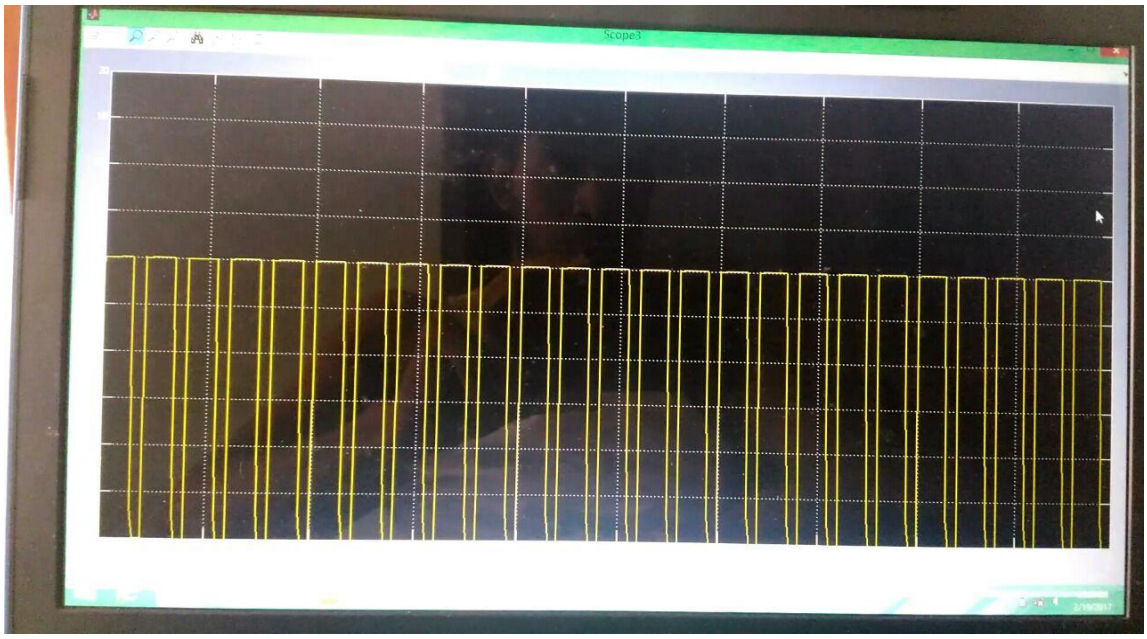

Fig 7 Output diagram

IV. Conclusion

The proposed system combines three different renewable energy sources, hence more energy output can be obtained. It is the efficient method to convert pressure energy to electrical energy by reducing the losses. If the system is installed in the children's park various health problems causing to children by the usage of rides can be reduced. This project mainly aims to generate the electricity using the cycle pedalling. Using the generated electricity the mobile phones can be charged..With the advent of new technology the way of communication is also changed. Mobiles are now everyone's first choice gadget, either an elderly person or a younger one. So in the present society the role of mobile phones are inevitable. Mobile users can't even imagine their world without their handset. So the chances of drains out of the mobile phone charger is common. During evening most of the phones will have very less charge. So while coming with their children's in the park the parents can use the hybrid charger to charge the mobile phones and also have good time with their children's. The hybrid charger is eco friendly

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