



## Collage Of various Power Sources from Energy Efficient Techniques

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### Abstract—

Electric power is the need of the hour and without electricity life seems handicapped. In the present scenario almost everything relies upon electricity. Energy is the cornerstone of our modern society. It permits services and opportunities that range from the simple to the profound, from cooking meals to education. In this paper we have shared some energy efficient techniques by which we can produce enough power to satisfy the basic needs. We employ three techniques for power generation which include piezoelectric crystals, speed breakers and solar energy. We also have included the Wireless transmission of collage power sources to remote ends. This generated power can be used for general purpose applications like streetlights, traffic signals, charging electric cars. In addition, we could also have solar panels and piezoelectric crystals which would satisfy our power needs.

**Index Terms - Kinetic energy, Speed breaker, Electro-mechanical unit, Electric dynamo, Non-Conventional Energy, Mechanical pressure, piezoelectric effect, piezoelectric material.**

### I. INTRODUCTION

We require electricity at every point in our daily lives and in this era of increased growth in population has resulted in the lessening of conventional sources of energy. In the present busy life a lot of vehicles move over the roads frequently and each passing by vehicle has enough kinetic energy that is lost. We can capture that kinetic energy which then converted to potential energy can serve our purpose. We can tap the energy generated and produce power by using the speed breaker as power generating unit. The kinetic energy of the moving vehicles can be converted into mechanical energy of the shaft through rack and pinion mechanism. Then, this mechanical energy will be converted to electrical energy using generator which will be saved with the use of a battery. In addition to this we have used piezoelectric materials which can be installed on a road stretch to generate power. Finally, we also have used solar panels to capture the power during day time which can be utilized for future use. All the stored power can also be transmitted wirelessly from remote ends for general purpose applications.

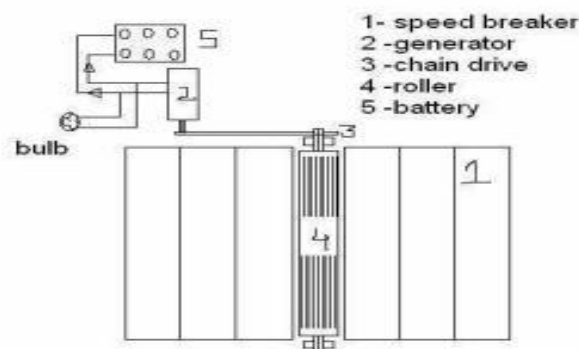
### II. RELATED WORK

Exploitation of energy resources is the major jeopardy to conventional sources. It led to the development of various techniques to generate power and one of the major techniques is to generate it from speed breaker or power hump. During South African power crisis they employed this method to light up small villages near the highways. The limelight behind this is simple idea of physics which is to convert the kinetic energy into mechanical energy and the same to electrical energy. Piezoelectric materials have been installed in places like temples, railway stations etc. where huge rush of people is observed and their movements generate power. Since then, a lot has been done in this field. An amateur innovator, Kanak Gogoi in Guwahati has developed a similar contraption to generate power, when a vehicle passes over speed- breaker. The idea has caught the eye of IIT-Guwahati, which funded the

pilot project related to generate electricity from speed-breakers.

### III. PROPOSED SYSTEM

The energy of the moving vehicles which is kinetic energy gets wasted and it is trapped by an arrangement called power hump which converts mechanical energy to electrical energy as shown in Fig(1). It is an Electro-Mechanical unit.



**Fig.1 Top View**

The kinetic energy of the vehicles is converted into rotational motion of the roller which further generates power. In this project, a roller is fitted in between a speed breaker and some kind of a grip is provided on the speed breaker so that when a vehicle passes over speed breaker it rotates the roller. This movement of roller is used to rotate the shaft of D.C. generator by the help of chain drive which is there to provide 1:5 speed ratio. As the shaft of D.C. generator rotates, it produces electricity. This electricity is stored in a battery. Then the output of the battery is used to lightening the street lamps on the road. Now during daytime we don't need electricity for lightening the street lamps so we are using a control switch which is automatically operated.

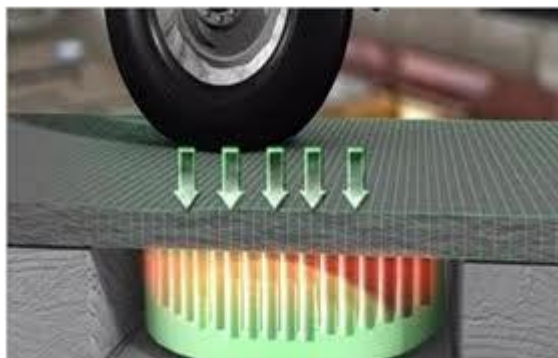


**Fig.2 Side View**

The conversion of mechanical energy into electrical one is generally achieved by Dynamo - a convertor alternator. But there are other physical phenomena that can also convert mechanical movements into electricity, one of which is piezoelectricity.

The piezoelectric effect exists in two domains, the first is direct piezoelectric effect that describes the material's ability to transform mechanical strain into electrical charge, the second form is the converse effect, which is the ability to convert an applied electrical potential into mechanical strain energy.

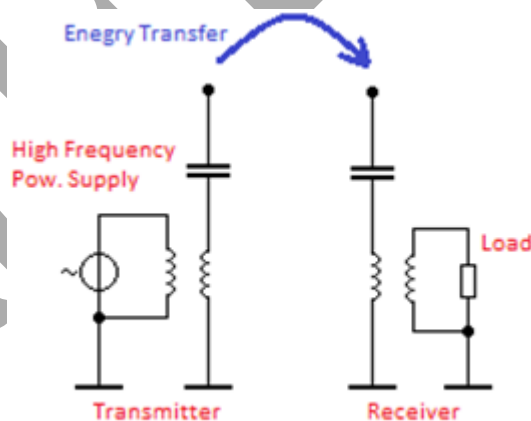
Constructing special types of roads that generates electricity just by driving over them is next step towards use of piezoelectric crystals. The system works by embedding tiny piezoelectric crystals into the road. When cars drive over such roads crystals embedded in them squeeze and thus generate a small electrical charge. Though small charge is generated by single car but 1 km stretch of such road could generate around 400kW.



**Fig.3. Specially designed road which generates**

#### Electricity

We propose a system named the wireless transmission of electricity in which we collect all the generated power from piezoelectric materials, solar panels and power hump and transmit it wirelessly in the form of magnetic flux using a tesla coil to remote ends. The power is stored from the solar panel during the day time and same can be used to light up street lights during night time. Piezoelectric materials and power hump give enough power to light up small villages nearby roads.



**Fig.4. Wireless Power Transmission**

## IV. EQUIPMENT REQUIRED

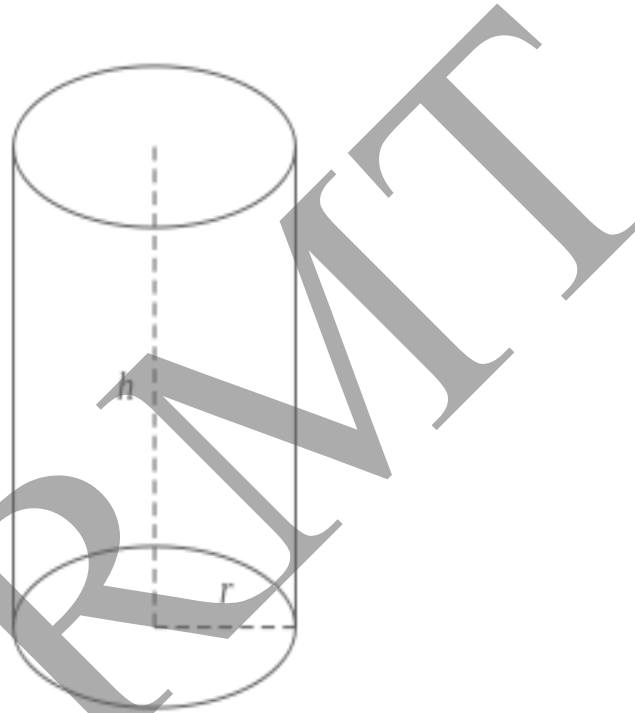
### A. WOODEN SHEET:

The wooden sheet is made of plywood. It is used to make the base and tapper part of the project. Plywood is a type of engineered wood made from thin sheets of wood veneer, called

plies or veneers. The layers are glued together, each with its grain at right angles to adjacent layers for greater strength.

### **B. CYLINDRICAL ROLLER:**

The cylinder is used to transform the linear kinetic energy into rotational kinetic energy. It makes a contact with the tyres of the moving vehicles. Thus the acceleration of the vehicle is converted into the rotational torque. It is made of cast iron and can also be made of any other material as per economy and applications consideration. The cast iron is quite cheap and it has higher load carrying capacity.



**Cylindrical Geometry**

### **C. BEARINGS:**

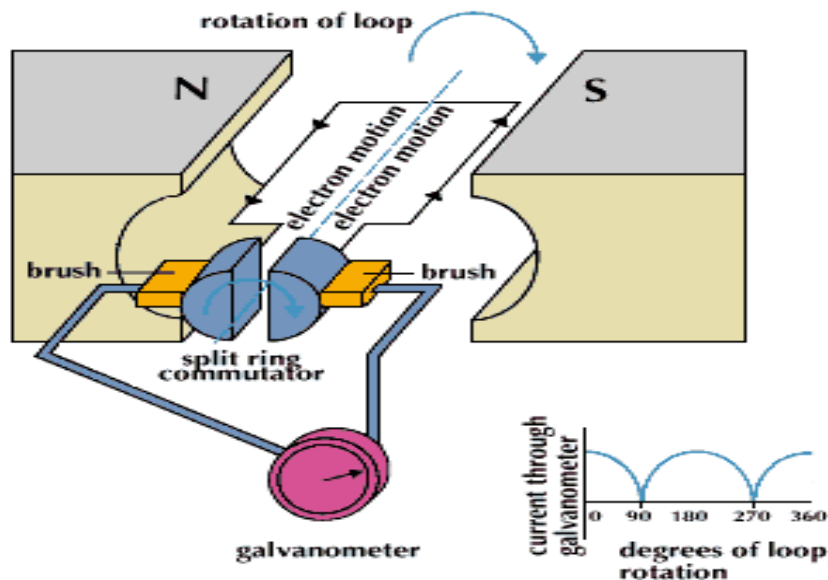
A bearing is a device to permit constrained relative motion between two parts, i.e. rotation or linear movement. Bearing is used to reduce the friction and increases the frictionless rotation of the shaft. There is a rolling contact bearing is used. A rolling contact bearing consists of four parts-

- Inner race
- Outer race
- A rolling element
- Cage (which hold the rolling element and spaces the rolling element evenly around the periphery)

### **D. DYNAMO:**

A dynamo is a machine that converts mechanical energy into electrical energy by using the principle of magnetic induction. This principle is explained as follows-

- Whenever a conductor is moved within a magnetic field in such a way that the conductor cuts across magnetic lines of flux, voltage is generated in the conductor.
- An elementary generator consists of a wire loop placed so that it can be rotated in a stationary magnetic field. This will produce an induced e.m.f. in the loop. Sliding contacts (brushes) connect the loop to an external circuit load in order to pick up or use the induced e.m.f.



### Power Generation Process

#### V. OBSERVATIONS

As far as the experiment concerns, we have two related observations with regard to the voltage generated to the variations in speed and load. The following were the two illustrations:

a. Let us consider the load (heavier vehicle) is constant on the speed breaker. Now we have the voltage produced, to the variations in the speed of the vehicle. If the vehicle runs 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 the voltage produced.

b. Let us consider the speed (usually low) of the vehicle is kept constant on the speed breaker. Now we have the voltage produced, to the variations in the load (vehicles) applied on the speed breakers. Assume, if the vehicle that runs over it has the least load capacity compared 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.

#### VI. CONCLUSION

"Electricity plays a very important role in our life". Due to population explosion, the current power generation has become insufficient to fulfill our requirements. In this project we discover technology to generate electricity from speed breakers in which the system used is reliable and this technique will help conserve our natural resources. In coming days, this will

prove a great boon to the world, since it will save a lot of electricity of power plants that gets wasted in illuminating the street lights. As the conventional sources are depleting very fast, it's high time to think of alternative resources. We got to save the power gained from the conventional sources for efficient use. So this idea not only provides alternative but also adds to the economy of the country.

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