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NON CONVENTIONAL SOURCES: FUTURE OF ENERGY

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***Abstract*— Non-Conventional sources of energy is a trending subject now a days, because of the continuous demand of energy. In this paper I am going to put forward a couple of Non-Conventional and renewable sources of energy which could solve the problem of "Energy Crisis".**

***Index Terms*— Piezoelectric Effect, Piezoelectric Materials, Solar Energy, Refraction, Load per sq. cm, Efficiency.**

I. INTRODUCTION

India is a developing country and it is leading rapidly towards becoming a developed country. One of the major problem that India is facing is the shortage of energy that we call as "Energy Crisis". The amount of electricity generated in India by all the sources is nearly 1, 82,000MW. India is fourth in the list of largest power consuming countries in the world. Most of the power is generated through the conventional sources of energy namely Thermal Energy, Hydroelectric Energy, Nuclear Energy, Tidal Energy, Wind Energy etc.
The main drawback of the Thermal Energy is that it requires Coal whose amount is reducing day- by-day. Other sources are not able to provide as much energy as required. Hence, the need of such a Non-Conventional and renewable source is required which will fulfill all this requirements. In this paper, I am going to introduce you with two such sources of different kind but will be proven useful to India. They are "Piezoelectricity" and "Solar Bottle Lamp'.

II. PIEZOELECTRIC EFFECT

Piezoelectricity is the property which is shown by certain materials which are known as Piezoelectric Materials. Using this effect electricity can be generated from the piezoelectric materials.

When the pressure is been applied on Piezoelectric Materials there is a tensile stress produced in them. When the pressure is removed from the material there is a compression in the material. The continuous Tension and Compression Cycle causes Electric Current to be produced in them. These current can be obtained in from of electricity by means of Piezoelectric Generators.

This effect could be implied in the places where there is a constant Tension and Compression processes are available. In this paper, we are going to discuss about few ways of generating electricity from piezoelectric materials.

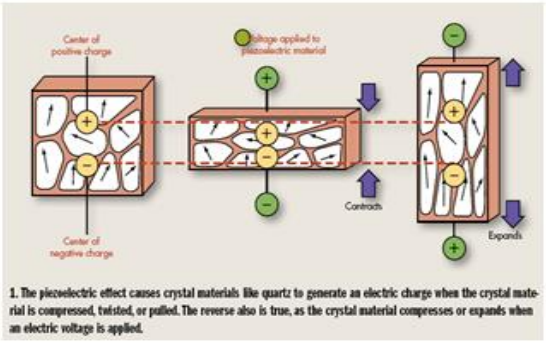

Fig. 1: Illustration of the Piezoelectric Effect

III. PIEZOELECTRIC MATERIALS

There are several Piezoelectric Materials such as Quartz, Topaz, Lithium Neobait, Rochelle Salt etc. We could come to the conclusion that the materials are very costly, but it is not true. It is true that the materials like Quartz and Topaz are costly, but not the Rochelle Salt. Rochelle Salt Crystals could be produced in laboratory by means of the simple chemicals like Potassium Bitartrate, Sodium Bicarbonate and Distilled Water. Hence the Piezoelectric Materials are not expensive as they seem to be.

Also, after a several research made from several decades, it is found that A Human Bone is also a great Piezoelectric Material. Thus, finding piezoelectric material is not an expensive program which separates it from other Non-Conventional Sources of energy like Nuclear Energy.

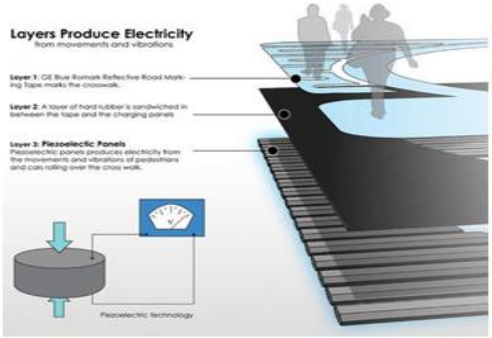

Fig 2 : Illustration of Layers of Piezoelectric Material

IV. APPLICATIONS OF PIEZOELECTRIC EFFECT

There are several applications of the Piezoelectric Effect which are currently in use. These applications are used in day-to-day life. Here are these applications:

Clock: A clock is an ideal example of the piezoelectric effect. In a clock, there is application of Reverse Piezoelectric Effect. The Quartz in the clock is powered by Lithium Cell, which provides the electric charge and the vibration is produced in the Quartz and hence the hands of clock is moved.

Lighter: A Gas or a Cigarette Lighter is another application of Piezoelectric Effect. It is the application of Direct Piezoelectric Effect. In the lighter, the pressure is applied mechanically on the Piezoelectric Material Sheet by means of a Push. Then the current is produced which causes to raise a flame.

Not only this common daily life applications, but there are several other application of Piezoelectricity to generate the electricity. They are:

In Japan, near the Tokyo Railway Station, there is a Piezoelectric Material Tile placed on the road near to the station. Daily, many people walk through it to generate electricity.

In UAE (United Arab Emirates), there is an experiment conducted to generate electricity from the Piezoelectric Roads. The experiment was successfully conducted and now the practical roads are on the way of construction.

In USA (United States of America) in certain schools, electricity is generated from Piezoelectric Tiles in the passage when students walk through them.

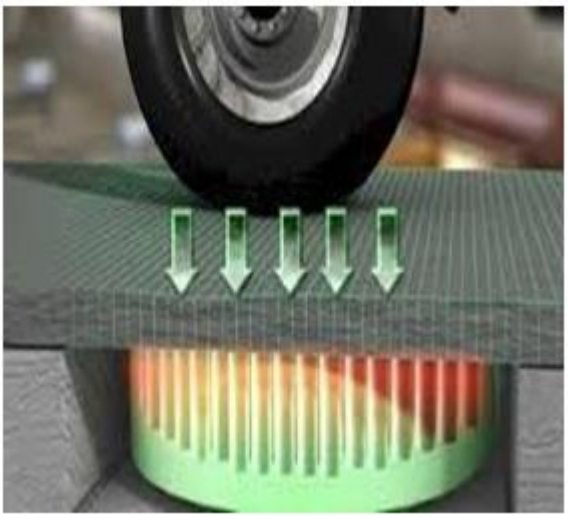

Fig 3 : Illustration of Piezoelectric Setup on Roads

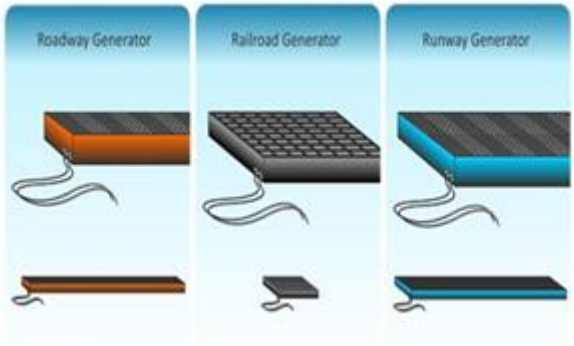

Fig 4 : Various kinds of Piezoelectric Generators

Fig. 5 : Piezoelectric Tiles near Tokyo Railway Station

This gave us a little idea about how electricity is generated from the Piezoelectric Effect. Now, let's move to the concept of our paper.

V. PIEZOELECTRICITY FROM INDIAN RAILWAYS

India is the second largest country in the world with respect to population and Indian Railway is one of the most important part of India's transport. 'Indian Railway' is known as lifeline of the nation as it is one of the largest railway network in the world comprising of 1,15,000 km rail track over a route of 65,436km. Last year, it carried about 8.125 billion passengers annually whereas 23 millions of passengers daily. Most interesting part is that half of these were suburban passengers. Of this 23 million nearly 7 million passengers are from Suburban Railways of Mumbai.

As you have got that when there is a continuous Tension and Compression available, electricity can be generated from Piezoelectric Effect. So, my idea is to capitalize the load offered by the coaches of the train into electricity by applying Piezoelectric Effect. For this a special kind of setup is to be made on the track. As the train passes from the track, there will be a Tension and Compression simultaneously available on the track. Hence, there will be the Piezoelectric Effect which will produce electricity.

For a Pressure of 50kg,the amount of electricity generated from 1cm2 area will be 0.001W.

Thus, amount generated by one train can be calculated as follows- Area of one Track Setup = 100 cm2

Load on each wheel (For Express) = 5000 kg Load on each wheel (For Local) = 3000kg Thus, Electricity generated by 1 wheel will be- For Express Trains = 10w

For Suburban Trains = 6W

On this, basis we could figure out the calculations for electricity generated by all Express and Suburban trains assuming such 8 setups per track on the main stops of the train.

According, to statistical data that I a obtained, there are more than 2,000 Express Trains which we can assume that run 200 days per year. Also, the Suburban Railways of Mumbai have more than 1,600 trains which run daily.

Thus, the calculations of electricity generated by the trains on 5 stations on its routes are as follows-

Electricity Generated by Express Trains = 12800MW

Electricity Generated by Suburban Trains = 6450MW

Thus, a total of 19,250MW of electricity is generated per year from the trains.

VI. PIEZOELECTRICITY FROM FOOTSTEPS OF PASSENGERS

As given earlier in the paper that electricity could be also generated from the footsteps of the passengers and it is been successfully generated in Japan outside Tokyo railway station. Suburban Railways of Mumbai serve more than 7 million passengers per day which is a huge figure. Thus, electricity can be simultaneously generated from footsteps of passengers.

Assuming the weight of every passenger given as 50kg and he walks 100 steps on the staircases and on the platform which is installed with Piezoelectric Tiles, then electricity generated by each passenger will be 10W.

This may appear very small amount, but when though of just 5 million passengers, electricity generated in 1 day will be 50MW. Hence, electricity generated in 1 year by the passengers will be 18,000MW.

This means, a total of 37250MW of electricity can be generated by the Indian Railways by the aid of Piezoelectricity. This is nearly 20% of the energy generated in India and it will save the coal or other conventional fuels which are required o produce this much of energy.

VII. OTHER POSSIBLE APPLICATION FOR PIEZOELECTRIC ENERGY

- On crowded highways where Toll is collected to generate electricity by load of vehicles.
- Indian Holy Place where lot of devotees walk over long distances
- On busy roads on which lots of people walk through daily.
- In schools and colleges where students walk by frequently

Fig 6 : Image showing Piezoelectricity from Footsteps

VIII. SOLAR BOTTLE BULB

Till now, we have talked about the electricity generation from Piezoelectricity which will generate electricity. This energy can be used by peoples who have access to the electricity. But what about the people who don't even have access to electricity?

In India 83,00,00,000 people live in rural areas which constitute to more than 70% of India's population. Many of the villages in India are not having electricity. Some of them have access to electricity but they still can't use it because of electricity bills. Hence, I have a solution to light up their homes at a very negligible cost. The solution is "Solar Bottle Bulb".

This concept arises from Philippines, where many people live in slums and don't have electricity at their homes. But the concept of Solar Bottle Bulb gave them a way to light their houses during daytime using free energy provided by sun.

What is a Solar Bottle Bulb?

It is a simple bottle bulb, usually a 1 liter soda bottle that is filled with a solution of Purified Water and bleach. The bottle is inserted halfway through a hole drilled in the metal roof and its sides are sealed. The whole deal looks like a bulb through a sunroof and provides a good amount of light by deflecting sunlight into gloomy interiors. The chlorine and bleach "poisons" the water to keep molds from developing so the

solution can last up to five years. The clear and purified water helps disperse the light through refraction, so the light is not concentrated. It only costs $1-2 to make a solar bottle bulb that is bringing light to dark homes.

The components required for a typical Solar Bottle Bulb are-

PET soda bottle
Galvanized Iron (GI) sheet
Rubber sealant
Bleach
Filtered Water

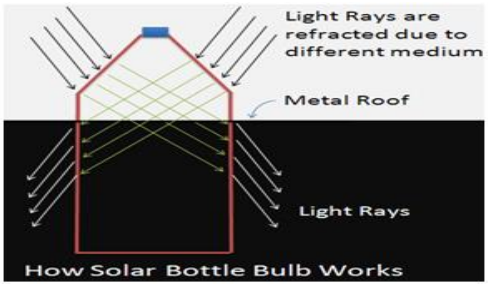

FIG 7 : ILLUSTRATION OF WORKING OF SOLAR BOTTLE BULB

In this way, this Solar Bottle Bulb can give up to a light of 50W incandescent bulb at free of cost. This bulbs can be efficiently worked in rural areas and also slum areas in the cities, where electricity is not affordable to the people.

Think of such bulbs installed in at least 10,00,00,000 houses in India then it could give a free electricity of about Rs. 300 billion for 5 years at a negligible cost. So, this could be a revolutionary idea for Indian Rural Area.

Though this bulb have several advantages but we should keep in mind that light will be only available in daytime not in night. Attachment of a solar disc and a small LED bulb could store the light in daytime and give it in night.

The campaign of installing the Solar Bottle Bulb is been started by an organization called Liter of Light. In India, the first trial of this bulb was taken in Vikrabad, a rural village in Telangana. This bulb is still in working condition since installed in 2011.

Fig 8 : A Solar Bottle Bulb

IX. ADVANTAGES

• Piezoelectricity can provide abundant amount of energy without any special power plant setup.
• Electricity generated from Piezoelectricity is Green Energy as it does not emit any harmful gases like Carbon Dioxide.
• Piezoelectric Materials and Generators are quite cheap as compared to other materials required for conventional electricity generation. E.g. Coal or Uranium.
• Output of Piezoelectric Power Generation is much more than conventional sources of energy. E.g. Thermal Energy, Nuclear Energy.
• Solar Bottle Bulbs are very cheap in cost when compared to other bulbs.
• Solar Bottle Bulbs can be even used with same efficiency where there is non electricity access

CONCLUSION

From all the information collected on this topics, I have came up to the conclusion that Piezoelectricity is able to fulfill the demands regarded to electricity generation and could be proven as an ideal Non-Conventional and Renewable source of energy. In case of Solar Bottle Bulb, this bulb can create a revolutionary change in India as it will lit up the light in millions of houses and no house will have darkness.

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