

POWER GENERATION BY USING PIEZOELECTRIC EFFECT IN TEMPLE

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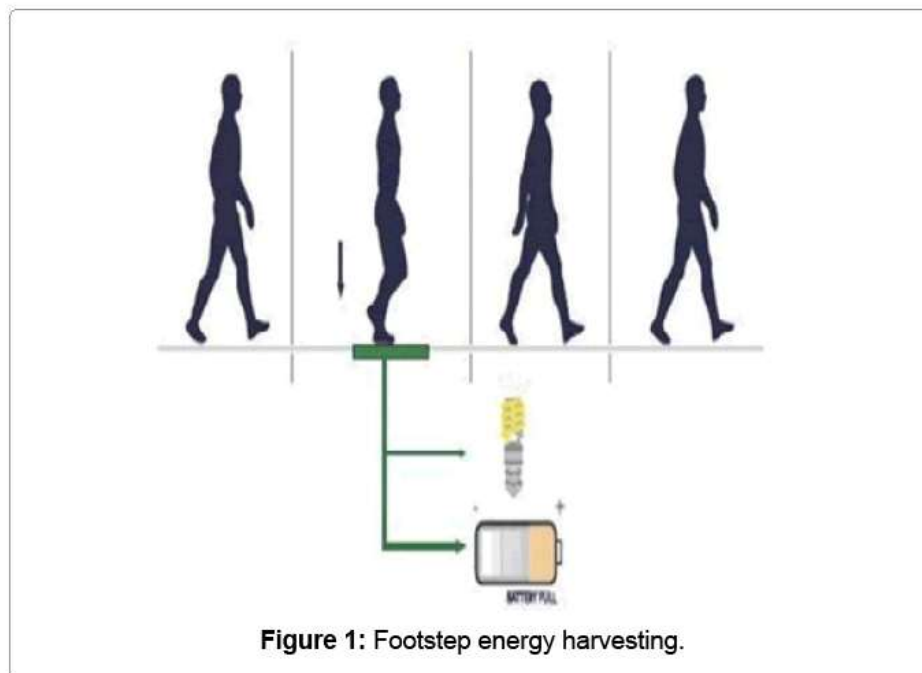
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Abstract:- Consumption of electricity is goes on increasing day by day. Number of users is increased; because of humans want more easy and comfortable life. For this comfortable life human trying to found new mechanisms and machines are operated automatically by means of electric power. From this we should be focused on generation of electricity. There are so many power generation methods are present everywhere such as Thermal power, Hydraulic power, wind power and solar power. But these are at macro levels, recently researcher founded some micro level electricity generations methods, that is the piezoelectric material. As we know function of piezoelectric material, it converts load/weight into voltage and current. So same phenomenon, we used in this case. In this case we are constructed piezoelectric platforms and installed in most famous temple that is the Shirdi. In this temple daily near about 20000 to 25000 peoples are visited, so we used their presence into generation of electricity by using piezoelectric material. We installed platform at exit of main entrance and exit of temple, we got desired output. Power generated from this temple is totally pollution free. This system does not require any external output.

Key Words:- Electric power generation, Piezo electric materials, Platform, Shirdi temple, Pollution free, PZT, PVDF, Inverter.

1. INTRODUCTION

Currently electricity becomes necessary part of human life, due to modern technology needs electric power to run various machines and mechanisms. But generation is constant. Quantity of water is also goes on decreasing, due to this hydraulic power plants closed. So it is necessary to found alternative solution, piezoelectric material is best solution for this problem. Because other sources give so much pollution but this system gives pollution free energy and it is economical. Purpose of this case study is electric power generation at small scale level to try to reduce negative effect on environment. Proposed system of electricity generation is based on piezoelectric effect. In this effect certain materials have ability to build up an electrical charge from having load apply to them. System is showed in fig no (1) It refers to ability of some materials to generate potential in response to apply load. In this system energy is harvesting by means energy available already. This was waste if we will not utilize.



1.1. SELECTION OF MATERIAL:

Material selection is very important role in piezoelectric system. Wrong material selection will gives the bad results. There are so many materials are present in market as like $PbTiO_3$, ceramic B, $BaTiO_3$, MCF, $PbZrO_3$, PVDF (Polyvinylidene fluoride) and PZT(Lead Zirconate Titanate). Main component of system is that material of piezoelectric; commonly two materials are used that are PVDF and PTZ. Now this important to fin d out which one is best both of two; criteria for selection of material is that check output voltage by application of load. From the VI graph it is clear that PTZ is best material [1].

2. PROPOSED LAYOUT:

In shirdi temple we can install platforms at different place where we will get more amount of energy. There are few places where we can install. From below diagram no.(1) we can get idea clearly.

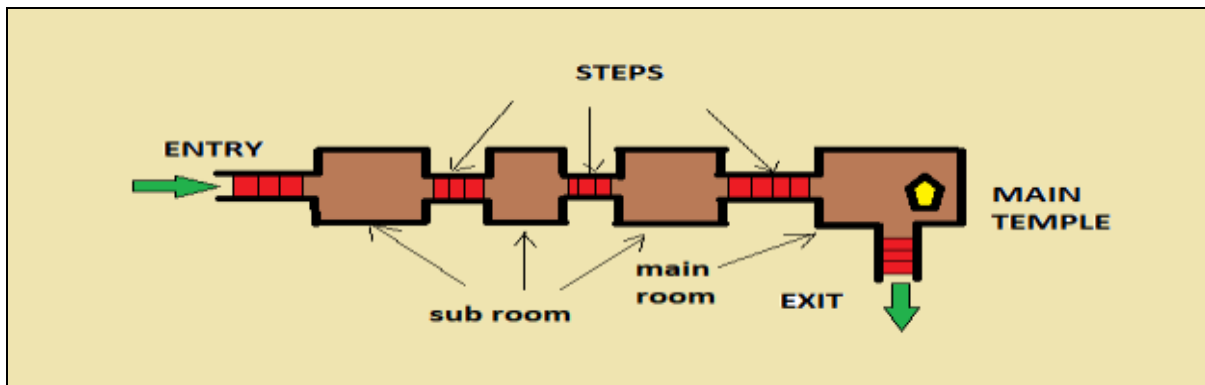


Fig no. (2) Proposed layout of system

There are 5 place are where we can install this system, which gives effectively electricity. Because of that place steps are present. In that temple continuously peoples are visited. So we have use their movement in that temple by constructing piezoelectric plant forms.

3. CONSTRUCTION:

In this system we can install 3 platform at single steps. Now question is arises that how to connect this platform to each other. There two ways either parallel connection or series connection. Now we can select this by understanding their VI graph, which shown as below fig no (3). By observing this graph we can say that voltage from series connection is good but current is so poor, where from parallel connection current is good but voltage is poor as compare to series. But we have solution to solve this problem. That is combination of this two systems. Below graph fig no.(4) shows system, from this gram we can say that, if we use combination of parallel and series then it gives best performance. So we should use this graph. In this system, on one tile, we connected 3 platform in series. There are 50 tiles are present in this temple.

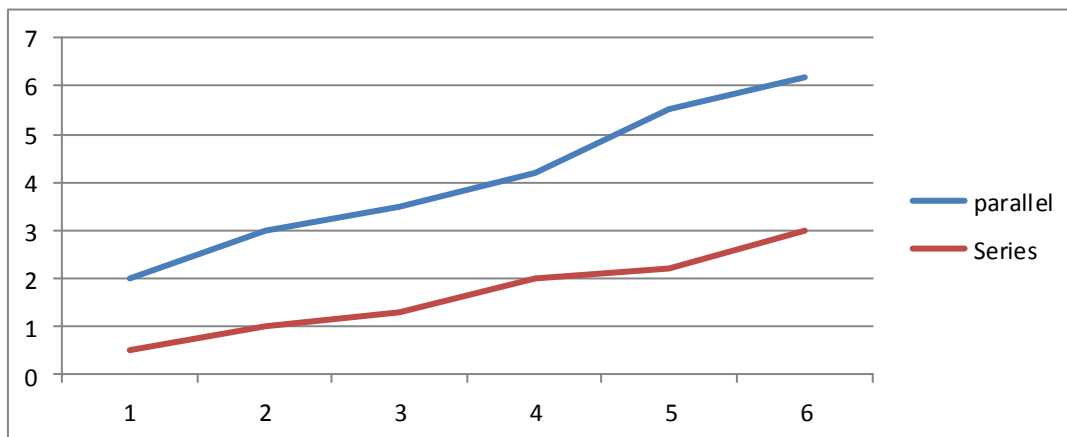


Fig no. (3) V-I Graph of parallel and series connection

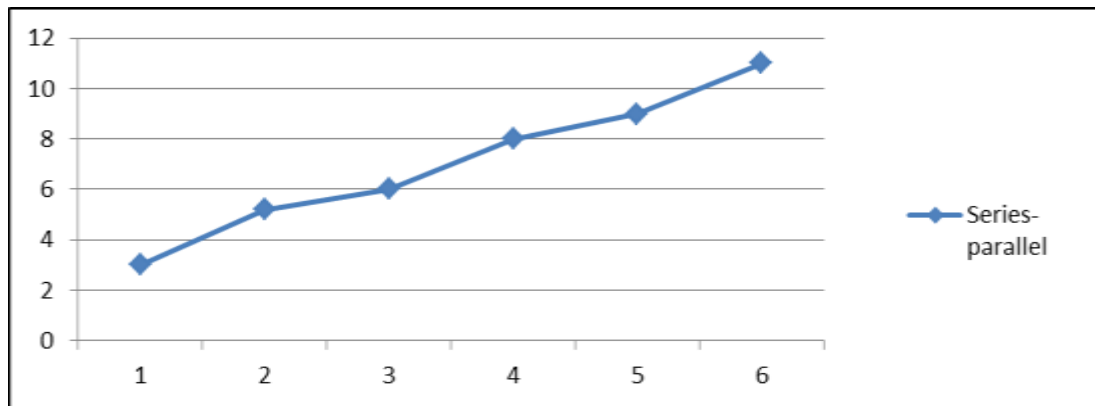


Fig no. (4) V-I Graph of parallel-series connection

4. WORKING:

Piezoelectricity is defined as change of potential with respect to change of application of load. so by using piezoelectric effect we can produce electricity. Main origin is displacement of ionic charges within structure. If external load is absent then there is zero output. Now this load is created from weight of person who is moving on plat form. System is shown below fig no.(5)

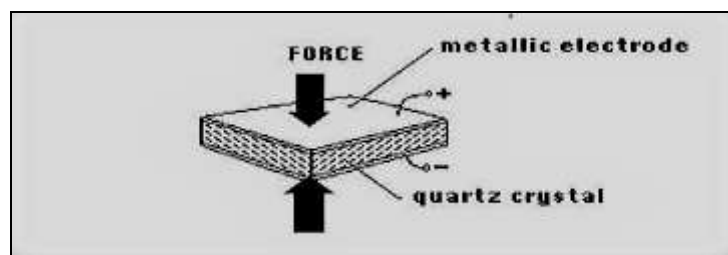


Fig no.(5) working of piezoelectric effect

Output of this system is not steady, so we used bridge circuit that converts the output unsteady to steady. Output of this system is AC, again we used ripple filter, that can filter further fluctuation in output. Now this output is stored in battery. Output from single platform is too small, that's why we connected that platform in parallel. So we get more output. An inverter is connected to battery to AC load purpose. For this plant we used microcontroller PIC16F873A. Oscillator is used for operation purpose. There is provision for display voltage variation with help of LCD which is connected to microcontroller. Inverter is used IC CD4047. Below fig no.(6) shows neat block diagram of system

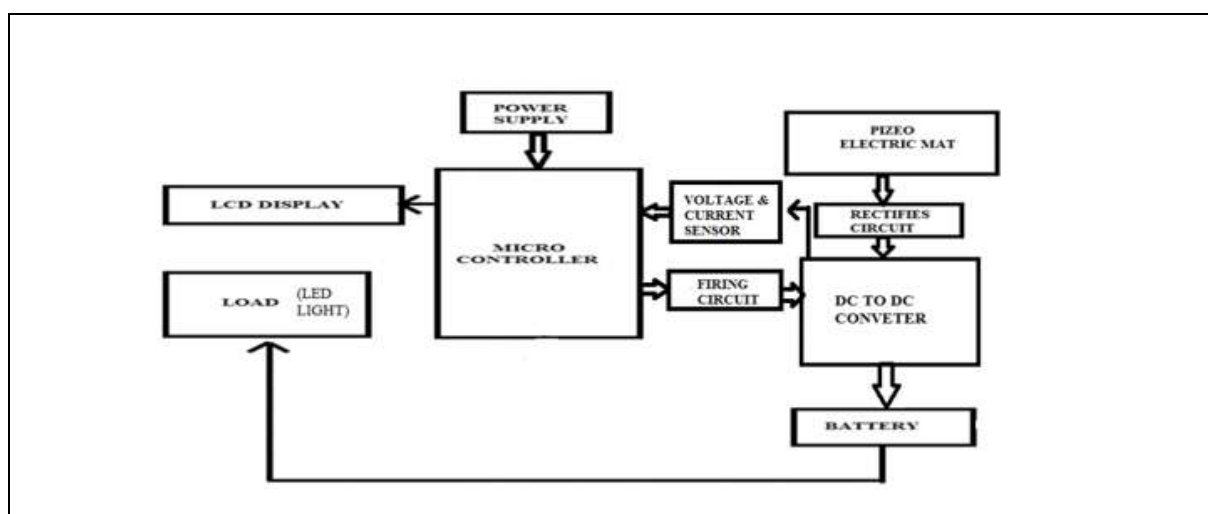


fig no.(6) block diagram of system.

5. VOLTAGE GENERATED AND POWER ANALYSIS:

Platforms are compared with capacitor during the voltage calculations. In this system 3 platforms are connected in series on single tile or step. That all tile connections are connected in parallel manner for each room in the temple. so from every platform we get 13V voltage, so as they are connected in series so

$$V_{eqsr} = V_1 + V_2 + V_3$$

$$= 13 + 13 + 13$$

$$V_{eqsr} = 39 \text{ Volt}$$

Where V_{eqsr} – equivalent voltage across series

So we can say that maximum voltage developed from each tile or step is 39 V. So there are 50 tiles are present in the temple.

There are 10 tiles are in parallel,

$$1/V_{eqpr} = 1/V_{eqsr1} + 1/V_{eqsr2} + 1/V_{eqsr3} + 1/V_{eqsr4} + 1/V_{eqsr5} + \dots + 1/V_{eqsr10}$$

$$1/V_{eqpr} = 1/39 + 1/39 + 1/39 + \dots + 1/39$$

$$V_{eqpr} = 3.9 \text{ V}$$

Generally peoples are weighted from 60 to 80 kg, so variation of power across weight is given by below fig no.(7)

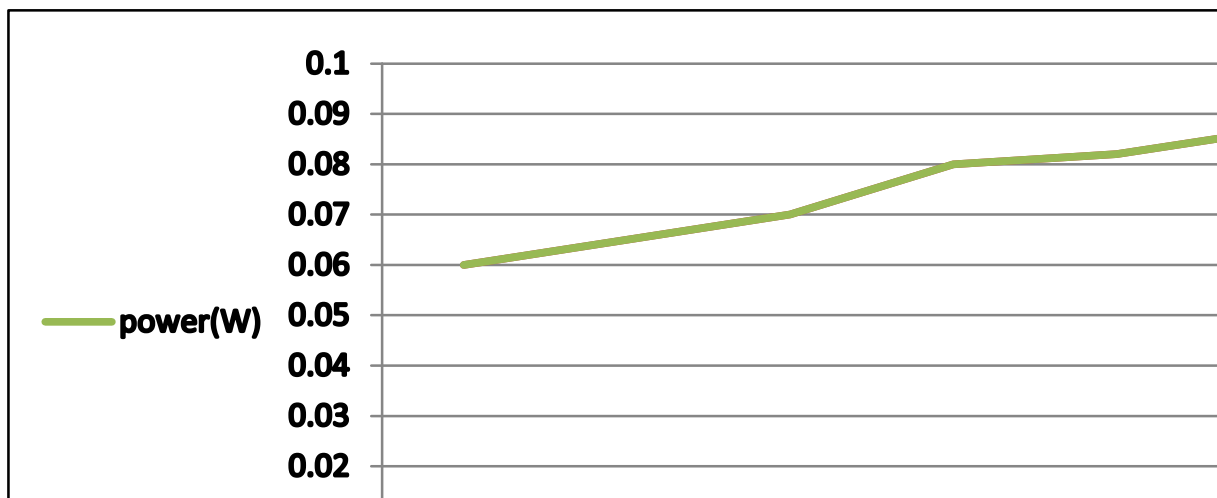


Fig no.(7) weight vs power variation graph

6. CONCLUSION

By observing generated voltage and power variation, we can say that a single tile gives near about 39 V and there are so many tiles are present in that temple. So from this we can some electric power, which is stored in battery. This energy can be further used for different applications in the temple. Applications such as street lightning, charging ports, lightning of pavements of main temple room, etc.

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