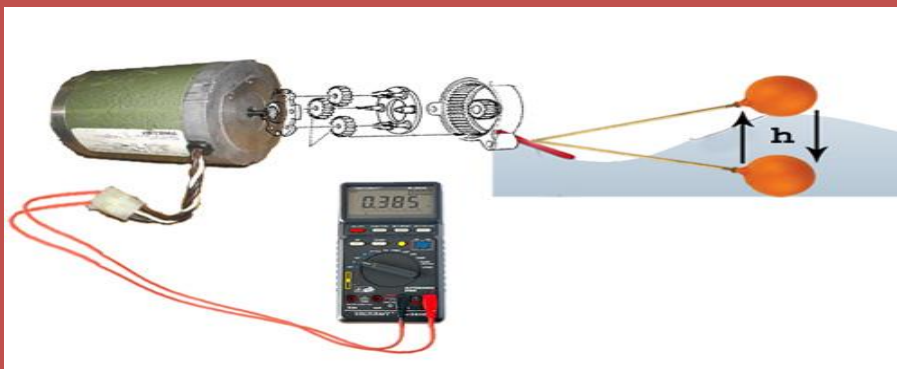




GENERATION OF ELECTRICAL ENERGY THROUGH MOVEMENT OF FLOATING BALL ON THE WATER WAVES.

Prof. Sohail Ibrahim



Generation of Electrical Energy through Floating Ball

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Subject Category: Energy Physics

Generation of electrical energy through movement of floating ball on the water wave.

This research project aimed to generate electricity at low cost through movement of floating ball on the water waves. Pakistan and developing countries across the world are facing shortage of power; therefore need to generate electricity at low cost. The project based upon the following scientific principle:

“Mechanical energy can be converted into electrical energy.”

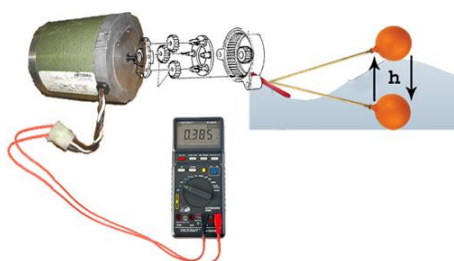
The process to generate electricity with the waves of the sea is very simple. Moving waves of the sea pushes the floating ball up and down that caused movement of the connected liver and pulley. The other end of the pulley is attached with the shaft of a generator and transfer moving force of the waves to the generator in which installed gear system control movement of the shaft in one direction and create electricity. The electricity generated with this process is low cost and environmental friendly that may resolve our load shedding problem.

The project was based on mathematical calculation that is as follows.

<p>Pressure of water waves</p>	<p>$P = \rho \times h \times g$</p> <p>$\rho$ is the density of water and h is the height of water waves</p>	<p>Speed of shaft coupled with generator</p>	<p>$F = (P * N)/120$, where F is the frequency (in Hertz) of the grid, P is the number of poles of the generators (an even number never less than two, and the number of poles of any generator is usually fixed and can't be changed while the generator is running), and N is the speed of the generator rotor, usually the field (in RPM).</p>
<p>Electric Power</p>	<p>$V \times I$</p>	<p>Wave Power</p>	<p>Wave Power = $F \times h / t$</p>

The more power can be obtained via this source then stored to use when required. This device has wide application and provides cheap electricity. This environment

friendly electricity can be utilized in areas like street lamps, traffic signals, homes and market places. Although it is not comparable with the electricity produced from other big sources like hydroelectricity but still it is worth producing.



Prof. Sohail Ibrahim (Asst. Professor)

Introduction

AIMS AND OBJECTIVES

- 1 To generate electricity efficiently without fluctuation or failure of power during the process.
- 2 Low cost/economical.
- 3 Use of floating ball on water waves for the generation of electricity.
- 4 Use of flywheel for continuous movement of shaft of generator.
- 5 Efficiency of the generator can be calculated by the formula:

$$E\% = \frac{\text{Output power}}{\text{Input power}} \times 100$$

Introduction to Concepts

Wave

When the wind blows across the water, it changes the water's surface, first into ripples and then into waves. Once the surface becomes uneven, the wind has an ever increasing grip on it. Storms can make enormous waves, particularly if the wind, blows in the same direction for any length of time.

Without waves, the world would be a different place. Waves cannot exist by themselves for they are caused by winds. Winds in turn are caused by differences in temperature on the planet, mainly between the hot tropics and the cold poles but also due to temperature fluctuations of continents relative to the sea. Without waves, the winds would have only a very small grip on the water and would not be able to move it as much. The waves allow the wind to transfer its energy to the water's surface and to make it move. At the surface, waves promote the exchange of gases: carbon dioxide into the oceans and oxygen out. Currents and eddies mix the layers of water which would otherwise become stagnant and less conducive to life. Nutrients are thus circulated and re-used.

WAVES TRANSFER ENERGY BUT NOT MASS

When we watch surf waves coming into shore, it's easy to think that individual water particles are moving towards us, but that's not actually the case. The particles involved in waves move back and forth perpendicularly to the way the wave are going, but don't move significantly in the direction of the wave. The particles 'take part' in the wave by bumping into one another and transferring energy. This is why energy can be transferred, even though the average position of the particles doesn't change.

How does this work?

*-It can help to think of a buoy bobbing in the ocean. The buoy is moved up and down by the waves that pass by it, but doesn't move directionally across the water. You could also think about a Mexican wave at a sports match. The wave moves around the arena, but the audience members don't move around with it – they only stand up and sit down (a perpendicular movement to the wave direction).

Particles in a water wave exchange kinetic energy for potential energy.

This prototype explains the generation of electricity with the help of movement of floating ball on the water waves. The idea is little different and interesting, but will successfully produce electricity by wave motion at commercial cost with more efficiency covering a minimum area. Velocity of the water wave is one of the important factors in this method.

EXPLANATION

As we know that air, water and sunlight are the great natural resources of energy as blessing of my Lord (Allah Subhan-o-Tala). Most part of the world is hot and with the increase of population as well as use of electrical appliances, world is facing energy crises, therefore, attempts are being made to get rid of these crises. We can overcome energy crises by utilizing pointed natural resources properly.

In view of this situation, the idea to generate the power through movement of floating ball on the water waves came in my mind and I shaped it into this project. The project is very simple but idea is unique as not introduced earlier.

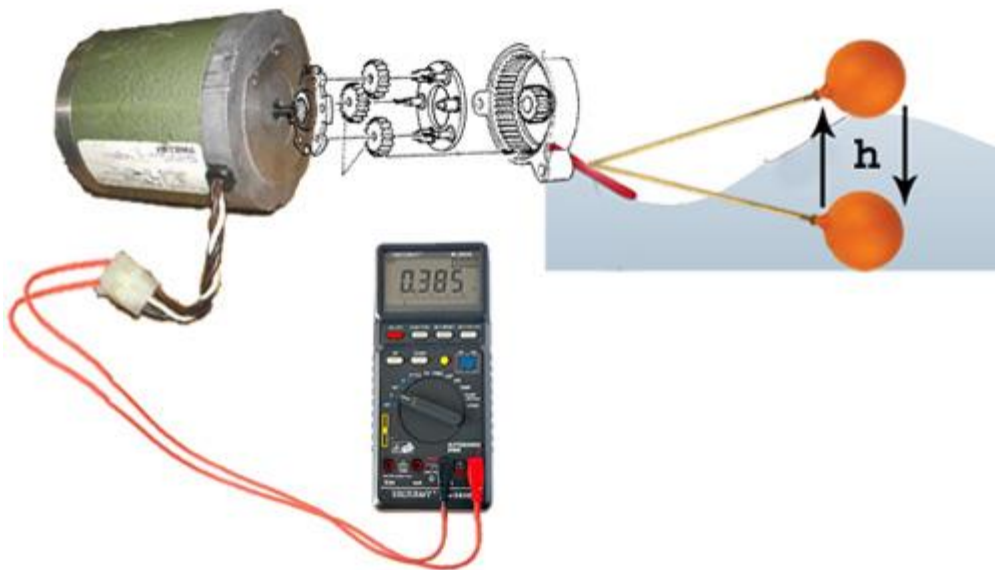
My project is to generate the power through Floating Ball. The whole project is consisting of four parts.

- 1) Water tank
- 2) Floating ball
- 3) Motor with pulley
- 4) Measuring instruments (Voltmeter/ampere meter)

Moving waves of the sea pushes the floating ball up and down that caused movement of the connected liver and pulley. The other end of the pulley is coupled with the shaft of a generator and transfer moving force of the waves to the generator in which installed gear system control movement of the shaft in one direction and create electricity. The electricity generated with this process is low cost and environmental friendly that may resolve our load shading problem.

Materials required

- | | |
|---------------------------|---------------------------------|
| ➤ Fan | Long Vessel like Pipe |
| ➤ Rotating Electrical Fan | Floating ball |
| ➤ Electrical Bulb | Electrical Motor with Generator |
| ➤ Connecting Wires | Welding Equipment |
| ➤ Socket Set | Pliers |
| ➤ Screwdrivers | Floating ball |
| ➤ Metal Shaft | Wire & L.E.D |



PROCESS

The process of generating power through movement of floating ball on the water waves is that the sea waves pushes the floating ball up and down that caused movement of the connected liver and pulley. The other end of the pulley is attached with the shaft of a generator and transfer moving force of the waves to the generator in which installed gear system control movement of the shaft in one direction and create electricity. The electricity generated with this process is low cost and environmental friendly that may resolve our load shading problem.

Generation of power through movement of floating ball on the sea waves.

Specification: PROTOTYPE

a) Area & Volume of floating ball.

Radius = 11 cm

$$\begin{aligned} \text{Formula: Area of floating ball} &= \pi r^2 \\ &= (3.142) \times (11)^2 \\ &= 760.364 \\ &= 4078.316 \text{ cm}^2 \text{ or } 0.4078316\text{m}^2 \end{aligned}$$

$$\begin{aligned} \text{Volume of floating ball} &= \frac{4}{3} \pi r^3 \\ &= 3.142 \times (11)^2 \times 11 \end{aligned}$$

$$\text{Volume of floating ball} = 18248.736 \text{ cm}^3 \text{ or } 0.018248736 \text{ m}^3$$

b) Pressure of water waves:

$$P = \rho \times h \times g$$

ρ is the density of water and h is the height of water waves

$$\rho = 1 \text{ Kg / m}^3, \quad g = 9.8 \text{ m/ sec}^2 \quad \& \quad h = 12 \text{ cm} = 0.12 \text{ m}$$

$$P = 1 \times 0.12 \times 9.8$$

$$P = 1.176 \text{ Pascal}$$

c) Force produced by of sea wave:

$$\begin{aligned} F &= \text{Area} \times \text{Pressure} \\ &= 0.4078316 \times 1.176 \\ \mathbf{F} &= \mathbf{0.4796099 \text{ Newton.}} \end{aligned}$$

Where F is the force (in Newton) on the Ball,
P is the number pressure produces by the water on the floating ball.

Speed Of wind at sea side:

$$V = \underline{3.50} \text{ m/sec (Annual Average speed in Karachi)}$$

Or

$$V = 3.50 \times 2.2 = 7.7 \text{ mph (miles per hour)}$$

Data Recorded By:

Faculty of Basic and Applied Sciences, Department of Physics
Sir Syed University of Engineering and Technology, Karachi-PAKISTAN
Energy and Environment Research Group
Department of Physics, University of Karachi,
Karachi-PAKISTAN

Water waves (Power) :

$$\text{Wave Power} = F \times h / t$$

$$= \underline{0.4796099} \times 0.12$$

1

$$= 0.057553188 \text{ watt}$$

e)Generation of electric Power :

Formula:

$$\text{Power} = V \times I$$

Where

V is the potential difference in volt

I is the current in ampere

P is the power in watt

OBSERVATIONS:

$$V = \underline{0.75} \text{ volt , } I = 58.5 \text{ miliampere or } 58.5 \times 10^{-3} \text{ Ampere}$$

$$P = V \times I \\ = 0.75 \times 58.5 \times 10^{-3}$$

$$\text{Electric Power} = \underline{0.043875} \text{ watt.}$$

$$\text{Wave Power} = \underline{0.057553188} \text{ watt}$$

Efficiency

$$\text{Efficiency} = \frac{P_{out}}{P_{in}} \times 100$$

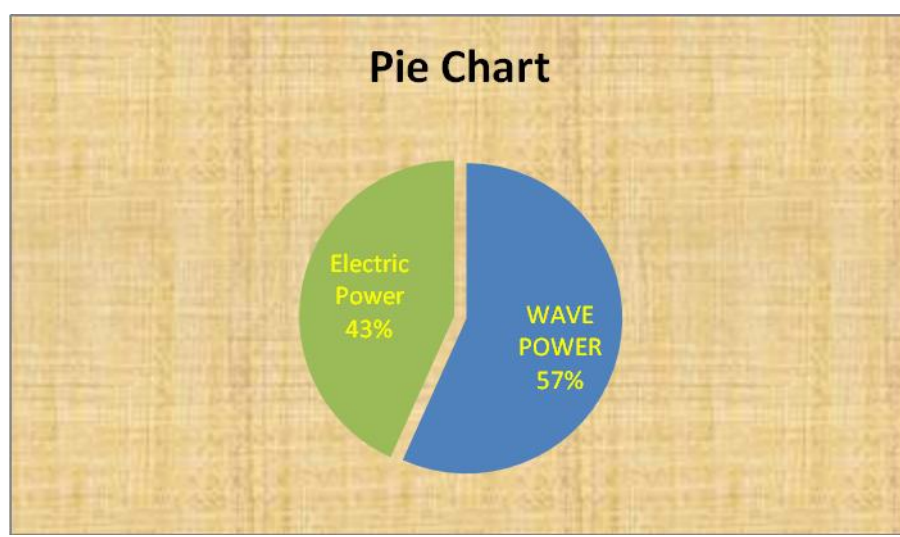
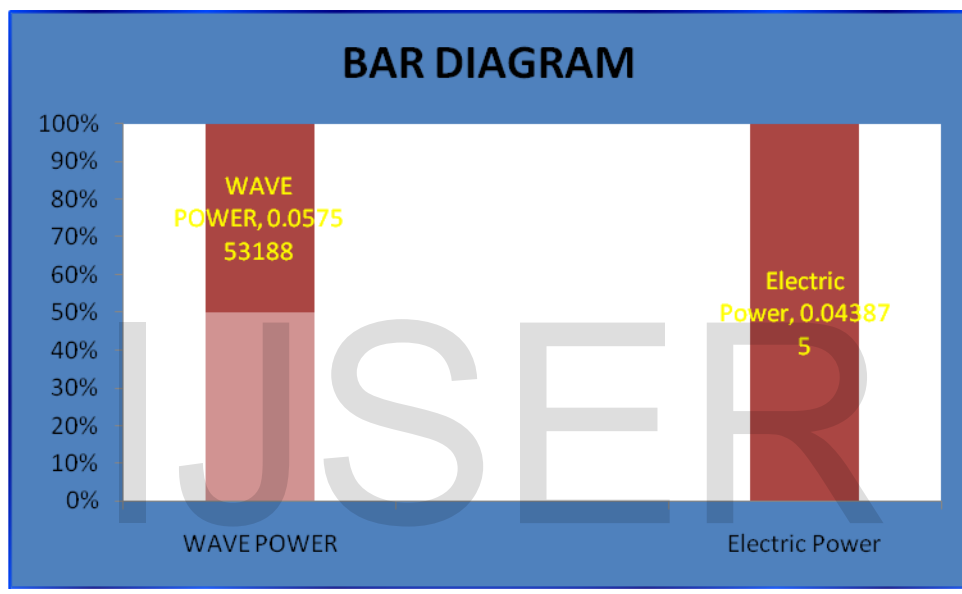
$$= \frac{0.043875}{0.057553188} \times 100$$

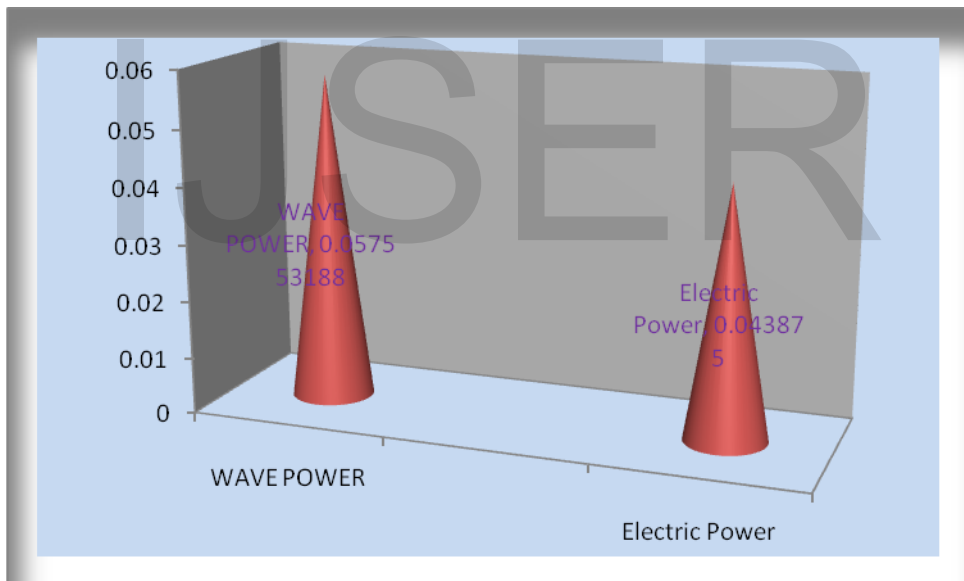
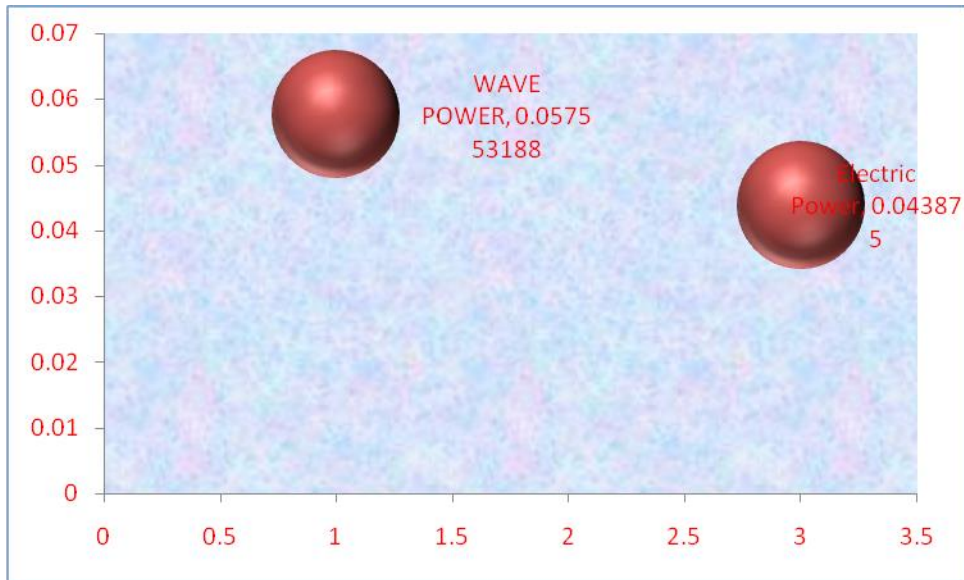
$$E = 76.233 \%$$

Result

It is proved that power can be generated through movement of floating ball on the sea waves.

GRAPHS





Recommendations

Following observations are recommended.

This technique can be used very effectively in industry for the generation of power. The problem of load shedding or shortage of power can be resolved by using hot air for generation of electricity.

Future Plan:

Following plan has been designed for better efficiency of Generation of power through floating ball more economically.

- 1- To increase the length of rod coupled with ball.
- 2- Increase the diameter of floating ball
- 3- To increase the efficiency of system by using frictionless pulley coupled with generator.
- 4- To adopt any technique for stable generation.
- 5- To increase the sensitivity of Project by removing any types of friction produced.

Conclusion

We have observed that it is more economical and more efficient because there is no setback in this project. We have tested its working capacity and efficiency which proved to be successful. After practical observation it proved that it is more efficient and reliable than other system. This is an engine that is run by the water waves and to generate power through movement of floating ball. Such project can be installed at sea shore and bank of the rivers which will work more efficiently by the movement of waves. As the power of waves increases the floating ball speed also increase and simultaneously the motion of shaft coupled with generator also increase which produce more electrical energy. The produced electrical energy can be stores and Stable by different techniques.

In Pakistan we have a lot of areas especially a large area of bank of the river and sea there this project work more successfully. Thus, we can generate the power by using the movement of floating ball on the sea waves. It is new idea and very economical and different in shape.

On the base of the practical observation it is concluded that we can overcome the problem of shortage of electrical energy by using this technique too.

Thanking You.

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