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Study of Floating Solar Plant and Wave Energy Converter on Dam

Mayur Dongare[1], Abhishek Funde[2], Nishant Khairnar[3], Atharva Bhalerao[4], Aditya Wankhade[5], Pradnya Kulkarni[6]

[1]*Student, Department Of Civil Engineering, Dr.D.Y.Patil Institute Of Engineering Management And Research, Akurdi, Maharashtra, India*

[6]*Assistant Professor, Department Of Civil Engineering, Dr.D.Y.Patil Institute Of Engineering Management And Research, Akurdi, Maharashtra, India*

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ABSTRACT:The project aims to study the concept of floating solar power plants and wave converters and analyze their potential to generate renewable energy. The study will evaluate their efficiency in different environmental conditions. The project will also investigate the possibility of combining wave converters with floating solar power plants to increase the overall energy output of the system.The study will involve simulations and experiments to collect data on energy generation and efficiency under varying environmental conditions. The results will be analyzed and used to optimize the design of the system and propose recommendations for improving the efficiency of floating solar power plants and wave converters. The project is expected to contribute to the development of renewable energy sources and provide insights into the potential of floating solar power plants and wave converters for meeting the world's increasing energy demand.

KEYWORDS: Floating solar Power panel ,Wave Energy Converter , Renewable Energy, evaporation, attenuator.

I. INTRODUCTION

When choosing the panels, electricity generation capacity is a key consideration. The different types of PV panels include poly, mono, thin film, and composite panels. The space occupied by the solar panel for the quantity of power generation is determined by the panel efficiency. The majority of crystalline modules will function very similarly and occupy approximately the same amount of space. With hybrid panels, you can produce more electricity from a smaller surface. However, in comparison to crystalline panels, they are too costly. Thin film units are ideal for dull, diffuse environments. They occupy a lot more space than other kinds but have very poor durability. The site of manufacturing and transportation costs also affect the price of solar panels

70% of the country's coal is used to produce 65% of the energy in India. Any water body can be covered with this device, which increases generation while lowering land costs thanks to the cooling impact of water.

1.OBJECTIVE.

a.To study the increase in efficiency of Floating Solar Plant with the help of "Wave Energy Converter" (attenuator).

b.Studying the Controlling of evaporation losses due to floating solar plant.

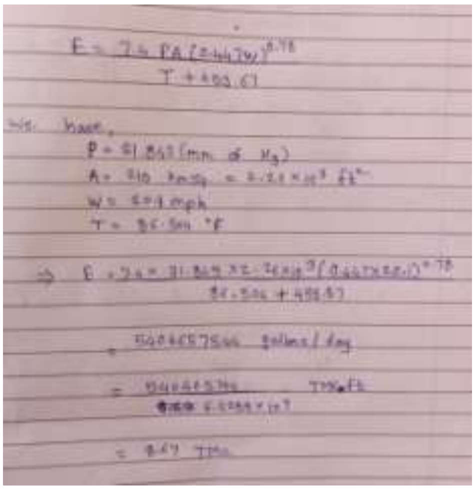
2.EVAPORATION.

Quantity of water vapour evaporated from the soil and plants when the ground is at its natural moisture content is known as evaporation.

$$E = \frac{7.4PA(0.447W)^{0.78}}{T + 459.67}$$

Where:

- E = Evaporation Rate (Gallons/Day)
- A = Pool Surface Area (ft^2)
- W = Wind Speed Above Pool (mph)
- P = Water's Vapor Pressure (mmHG) at Ambient Temperature
- T = Temperature (°F)



So, 8.67TMC/YEAR evaporation can be controlled due to floating solar panels in 210 kmsq. area.

3. POWER GENERATION BY FLOATING SOLAR PLANT.

Solar energy generated at Thoothukudi dam by SPIC company is 15,500MW or 42.46MW/DAY.

4.ATTENUATOR.

An attenuator wave energy converter (WEC) is a type of device that converts the energy from ocean waves into usable electricity. It typically consists of a floating structure that moves with the waves, and this motion is harnessed to generate power.

Fig. 1- Attenuator/ Line Absorber.

Here's some information on attenuator WECs along with numerical data calculations:

4.1.Power Calculation:

The power output of an attenuator WEC can be calculated using the following formula:

Power (P) = 0.5 * ρ * A * C * H^2 * η.

Where:

ρ: Density of the water (typically around 1000 kg/m³)

A: Cross-sectional area of the attenuator (m²)

C: Capture width ratio (dimensionless, typically between 0.4 and 0.5)

H: Significant wave height (m)

η: Conversion efficiency (typically between 0.4 and 0.5).

We have an attenuator WEC with the following parameters:

Cross-sectional area (A): 210 m²

Capture width ratio (C): 0.45

Significant wave height (H): 3.5 m

Conversion efficiency (η): 0.45

Operating time (t): 3600 seconds (1 hour)

First, calculate the power output:

P = 0.5 * ρ * A * C * H^2 * η

= 0.5 * 1000 * 250 * 0.45 * (3.5^2) * 0.45

≈ 143,414 W.

4.2.Energy Calculation:

The energy generated by the attenuator WEC can be calculated by multiplying the power output by the operating time:

Energy (E) = P * t

Where:

P: Power output (W)

t: Operating time (seconds).

We have,

p: 143,414 w.

t: 3600 secs.

E = P * t

= 143,414 * 3600

≈ 516,290,400 J (Joules) or 516.29 MWh (MegaWatt-hours) or 21.51 (MW/DAY).

II. RESULT AND DISCUSSION.

I. Water Evaporation Control – 8.67TMC/YEAR.

II. Electric Output of floating solar plant - 42.46MW/DAY.

III. Approximate energy generation by attenuator in the area- 21.51 MW/DAY.

III. CONCLUSION.

A. Reduction in evaporation with the help of solar panels.

B. We can Increase the efficiency of the floating solar plant by providing the wave converter and also can control the degradation and corrosion of the floats by the same.

C. Power generation of floating solar plant is 42.46 MW/DAY and power generation from a wave energy converter from the same area can be 21.51MW/DAY which in total to be 63.97MW/DAY. So, we can say that energy generation can be increased by 66% to fullfill the requirements.

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