

E1-28: Model studies for ocean wave power plant

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Several methods have been proposed to use the energy in the sea to generate electricity, including tidal power, buoy systems with resonant point absorbers and multi resonant oscillating water columns, Ocean Thermal Energy Converter (OTEC) etc. The following two conversional techniques were attempted to study the feasibility of power generation from ocean waves.

(a) Tapered Channel (Tapchan) method - In this method, the waves enter a funnel-like configuration of 2 concrete walls with a flat bottom. As the walls converge and the width of the channel narrows, the wave height increases until the water flows over the channel edge into a reservoir. The water in the reservoir is used to generate electricity by conventional low head hydro electric power plant technology. The passive tapered channel is used to convert the kinetic energy of the waves to potential energy head in the reservoir.

(b) Oscillating Water Column (OWC) - This device consists of a chamber, with a gate, resting on the sea floor and exposed to wave action. The wave action, pushes the air inside the chamber which is used to drive a special type air turbine known as "Wells" turbine.

In the Tapchan Channel plant it was observed that the efficiency recorded was 30%. Around Sri Lanka specific energy of waves is 35 KW/m. Hence the economical wave potential will be around

$$35 \times 1700 \times 1000 \times 30/100 \times 30/100 = 5355 \text{ MW}$$

where 1700 = Length of coast line along Sri Lanka
 30/100 = Assumed percentage of economical energy
 potential of waves around Sri Lanka

This gives a maximum capacity (efficiency) of the plant as follows:

Relationship between width of input and output channel: from 0.5. to 0.7

Relationship between length and input width: 0.3 to 0.5

Horizontal angle of channel bottom: 23° to 30°

These could be two effective methods to harness the enormous energy in the ocean waves.

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