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DESIGN AND DEVELOPMENT OF WAVE TURBINE

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ABSTRACT:

The basic principle of Hydroelectric Generator is used in Electricity generation by Floating Hydro-Turbine. Every aspect of a hydro system revolves around Head and Flow. The generation of electricity is simply a conversion of one form of power to another one. This research describes design and development of wave turbine that could be used in local seashore of konkan region of Maharashtra, India.

INTRODUCTION:

It is well known that hydropower converts the energy in flowing water to electricity. The volume of water flow is the most important factor that determines the quantity of electricity generated and the amount of "head" created by the dam. The greater flow and head results in more electricity production.

The work described below is an attempt to utilize wave power for energy generation. Here an intake collects the water and a pipe delivers it to the turbine, the turbine converts the water's energy into mechanical shaft power. The turbine drives the generator which converts shaft power into electricity. This electricity can be used in AC as well as DC. In AC system, this power is given directly to the loads. In a battery-based system, the power is stored in batteries,. Controllers may be required to regulate the system**.** As the waves are intermittent the energy stored is not continuous so to have continuous source of energy we can make arrangements to store the same in battery to be used in various applications.

LITERATURE REVIEW:

Shinya Okuhara et al proposed wells turbine used with booster turbine in their study. They used an impulse turbine for bi-directional flow as the booster turbine in order to improve the efficiency of turbine at high flow coefficient. This turbine is having a large Wells turbine, a small impulse turbine and a generator. They studied several wave energy devices under many wave energy programs in the UK, Japan, Portugal, India and other countries by making use of the principle of an oscillating water column (OWC).

Ali Arslan et al explain a zero head water turbine has been used as a source of power generation where construction of a dam for the head is not required. It works on natural flow of water to generate a specific power output. The power is however limited by flow of water which is sufficient to keep generate a suitable number of revolutions per minutes for the blades. The author have also studied the appropriate material such as Aluminum 6061-T6

Marie Lunde Saerterstad studied the concept of extracting kinetic energy from the tidal current. And concluded that the sizes of the turbines could be various as per the power requirements of users. This could be an economical source of power generation where electric power could not be provided due to absence of power transmission lines and requirements of huge investments on infrastructure. Such initiatives if supported by local governments could provide the fruits of electric power to dwellers of distant lands. She also found that Turbine blade design and number of blades are the vital parameter for extracting optimum power from a micro head turbine. And the velocity of water flow decreases from top (being the highest) to bottom, therefore the depth of stream may not have significant influence on the power generated.

Kees de blok et al described in detail the experiments and measurement results on Various bidirectional turbines in high frequent acoustic flow fields and at elevated mean pressures. The conclusion from the experiments so far is that this type of turbine could be a cost effective, scalable and efficient device for converting acoustic wave energy into rotation and from there into electricity

EXPERIMENTAL SETUP:

We firstly measure speed of the waves and the wind velocity. Since the project was going to be partly in the flowing water we had to select the select various materials for fabricating the turbine. The main condition was that they should be light weight and corrosive resistance .So we came up with Glass fiber reinforced polymer (GFRP) .The turbine were going to be coated with this material .The main advantage of this coating is that this material coating could withstand shock, corrosion and this would make this turbine durable. The main phase of this project is about the suspension system on which this turbine is going to be supported so we came with the idea about using the spring suspension

system. The turbine is going to be supported on the spring suspension system. The turbine is 13 going to be mounted on shaft which is going to be connected to dynamo. The turbine and dynamo is going to be connected with help of belt drive

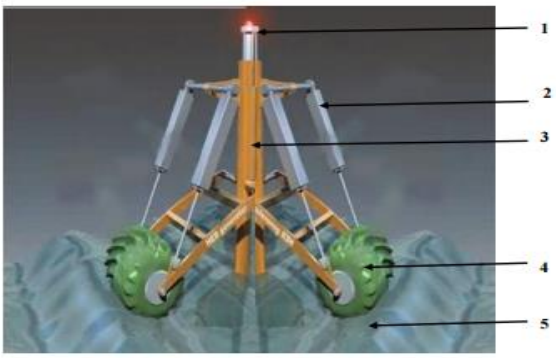

Fig. 1 Concept diagram
1: LED Lamp 2: Suspension System 3: Main Frame 4: Turbine 5: Sea Wave

Fig 2 Experimental Setup

ACTUAL OF WORKING OF THE MODEL:

In this project there are two turbines which are going to be rotated in the opposite direction. The turbines are mounted on the two different shafts with two individual dynamos connected respectively .The turbine are supported with the help of spring suspension system.

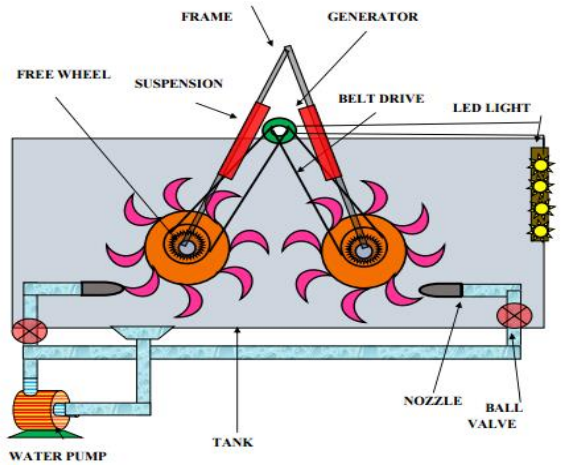

Fig 3 Diagram of bidirectional floating hydro-turbine

Fig 4 Actual setup

OBSERVATIONS AND RESULTS:

The testing is done with the help of nozzles system so that we could create wave like condition. The discharge was measured with help of rotameter where as the speed of the turbine was measured with the help of tachometer .The voltage obtained from the dynamo was measured with the help of multimeter. The voltage is measured and the turbine created enough power to light up LED.

Table 1 Observations table

Sr. No.	Flow (LPH)	Speed of Turbine 1 (RPM)	Voltage of Turbine 1 (v)	Speed of Turbine 2 (RPM)	Voltage of Turbine 2 (v)	Total voltage (v)
1	350	140	8.8	132	8.2	17
2	300	127	7.9	120	7.0	14.9
3	275	122	7.1	115	6.9	14
4	260	114	6.5	100	6.3	12.8
5	255	104	6.0	96	5.9	11.9
6	215	98	5.4	75	5.1	10.5
7	170	80	3.3	50	2	5.5

CONCLUSIONS:

One is able to generate energy from tidal waves which in turn can be stored in battery for future use.

By the virtue of above data as per this setup we were able to glow a 3v and 12v LED lamp for the average speed of 135 rpm.

We can conclude that this is Good alternative Source for current methods for Generation of Electricity

FUTURE SCOPE OF PROJECT:

As the waves are intermittent the energy stored is not continuous so to have continuous source of energy we can make arrangements to store the same in battery to be used in various applications.

1) Another improvement can be to make proper arrangements as per the waves flowing so that the

turbines are adjusting with help of proper suspension system.

2) As the metal has affinity to catch corrosion since the sea water is salty we can provide better corrosion resistant solutions to keep the frame from rusting.

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