Generation of Electricity from Ocean

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Abstract- Electricity has now become the fourth basic need of humans. The buoyant moored device basically is a floating type device whichuses the rise and fall of the swells to drive the pumps and is responsible for the conversion of energy in ocean waves to electrical energy.An overtopping system usesthe pumped fluid to fill the reservoir at a level higher than surrounding ocean. The potential energy thus available in the reservoir is captured by the low head turbines which further generates the electricity. The discussion covers the design, assembly and performance calculation of the buoyant moored devicealongwith overtopping system. This paper comprises the working and information of the main components of the system. The price of fossil fuel is rising day by day because of its scarcity in nature. As the operating cost of sea wave power plant is low and uses a renewable source of energy, it is possible to produce power at low price. Existing hydrostatic power plant needs dam. This is very harmful for environmental ecology and lives diversity. But this proposed plant does not require any dam or any other hazardous construction and this also reduces the installation cost. However it is reliable, sustainable, environmentally friendly power extraction procedure from sea wave.

I. INTRODUCTION

Able to manifest an enormous amount of energy Resources in almost all geographical regions. The global theoretical energy from waves corresponds to 8x106TWh per year, which are about 100 times the total hydroelectricity generation of the whole planet. To produce this energy using fossil fuels it would result an emission of 2 million tons of CO2.This means that wave energy could contribute heavily for the attenuation of pollutant gases in the atmosphere, as defended by the Kyoto Protocol [1]. The global wave resource due to wave energy is roughly TW and Europe represents about 320 GW, which is about 16% of the total resource. However, for various reasons, it is estimated that only 10 to 15% can be converted into electrical energy, which is a vast source of energy, able to feed the present all world. Eventually, wave energy could make a major contribution by yielding as much as 120 TWH per year for Europe and perhaps three times that level worldwide. The ocean is a true store of renewable energy. It is believed by some that only about 0.2 percent of the energy in ocean waves could power the entire planet [1]. The main reasons of figuring waves are propel of wind as well as the fluctuation of pressure below the water surface level. Though generating power from wave is not a recently introduced subject at all, very few works have been done using the surface wave of ocean compared to the system of energy generation from storing a huge amount of water and releasing it suddenly. Ocean Trader is a kind of floating object which is partially submerged in the water. This research is also about generating energy by using some submerged objects that are connected to a generator [2]. Ocean waves have two forms of energy (shown in figure 1): the kinetic energy of the water particles (in general follows circular paths) and the potential energy of elevated water particles. The combination of forces due to the gravity, sea surface tension and wind intensity are the main factors of origin of sea waves. The formation of sea waves by a storm. Wave size is determined by wind speed and fetch (the distance over which the wind excites the waves) and by the depth and topography of the seabed (which can focus or disperse the energy of the waves) [3]. © 2013 Global Journals Inc. (US) Global Journal of Researches in Engineering XIII Issue I Version I 13Year 2013 Volume ( ) J owadays the humanity has an energy resources lacking and it try to face it with new renewable energies instead of the old ones which are unsustainable and produce emission of CO2 and threaten to finish in few years. In this way, we have to consider the oceans like a good source which can provide us an amount of clean and inexhaustible energy. Three fourth of the world's surface is covered by the ocean. Most of the energy that arrives from the sun to the earth is retained by the water of the seas. The oceans are like a very great solar collector. Along

this century, several technologies have been researched to get the energy from the sea. Today there are four types of renewable ocean's energy that are becoming interesting for their good future perspectives. A useful expansion of the above categories is to add information on the location of the device. A typical set of definitions is to say that the device may be located onshore, near shore, or offshore. Onshore is exactly what it sounds like. Near shore are relatively shallow areas and offshore sites have depths were the waves are not affected by the bottom. Most energy can be found offshore since the waves have yet to lose energy in friction against the seabed.

II. METHODOLOGY

The methodology of sea wave power generation includes Basic design and operation and Output Analysis. Some figures are also included to explain the methodology more clearly. a) Basic design and operation The proposed power generation system is not a highly sophisticated process. It includes a number of empty vessels. The empty vessels get up and down randomly due to the upward wave thrust. Each empty vessel is connected to a crank. Cranks are attached with a single shaft. Empty vessel moves up and down. Crank facilitates this linear motion of empty vessel into the rotation of shaft. © 2013 Global Journals Inc. (US) Power Generation from Sea Wave: An Approach to Create Renewable Energy Global Journal of Researches in Engineering XIII Issue vI Version I 14Year 2013 Volume ( ) J Figure 2 : Schematic view of the power extractive mechanism There are sprocket system between crank and shaft. The sprocket system promotes only one way rotation of the shaft. At the time of upward movement of empty vessel shaft is engaged with crank, but at the downward movement of empty vessel sprocket system set crank free from shaft. Therefore shaft rotates when an empty vessel rises but the shaft doesn't respond to the downward movement of the vessel. Actually there is the random movement of empty vessel so shaft movement is not uniform. To remove this difficulty a fly wheel is connected to the shaft. Fly wheel give the opportunity to the shaft to rotate uniformly. Vibration may hamper the total structure, but total structure will be made considering vibration. It will be considered the resonance due to sea wave, empty vessel movement, air flow earth quack and what not. Figure 3: Gear Train Gear system is placed between generator and rotating shaft to drive the generator. Another function of this gear system is speed expedition. Main structure is hanged to the sea bed by rope. This structure makes it easy to move vertically to the response of water level variation. This system facilitates horizontal movement of main structure a little bit to the response of tide. Figure 4 : Total system fixing to the sea bed Precisely Power transmission from wave to shaft is the conversion of wave energy to mechanical energy. From the shaft power is again transmitted to the generator. At last generator transform mechanical energy to electrical energy. Generator is connected with the bus i.e. the transmission line by submerged cable. b) Output Analysis Empty vessels feel upward force which can resist weight of mass, $m_f=(v_v*\rho- m_v$ (1) Empty vessel get rise due to upward thrust of water. Then single vessel can make a thrust force, $F_{th}=m_f gh$ (2) The torque on shaft produced by an empty vessel, $T=F_{th}\times l_c$ (3) The shaft gains Energy from the toque produced by empty vessel. This energy for a single empty vessel, $E=2\pi N$ (4) Therefore due to n vessels, total energy, $P=n\times E$ (5) Energy is transferred from shaft to generator by gear mechanism. If gear efficiency is E_g, Then energy transmitted to generator, $P_g=E_g P$ (6) Generator accepts energy from shaft. Generator is not able to all mechanical energy into electric energy. If generator efficiency is E_m, electrical energy, $P_m= E_m P_g$ (7) Thus the electric energy generation capacity can be calculated using Eq.(7). A hypothetical calculation can be carried out with the following assumption: A sea wave power plant has 1000 empty vessels which are attached with the main shaft with cranks of length 5 meter. The volume and mass of the vessels are 1 m3 and 200 kg respectively. These empty © 2013 Global Journals Inc. (US) Power Generation from Sea Wave: An Approach to Create Renewable Energy Global Journal of Researches in Engineering XIII Issue I Version I 15Year 2013 Volume ( ) J vessels make the main shaft rotate at 2 RPM averagely. The gear mechanism has 95% efficiency and the generator has 70% efficiency. With these facilities this plant will be able to produce 325 MW. Figure 5 : Estimated Cost-volume analyses It needs to be realized that what amount of power production will be profitable. For this purpose cost volume analysis has been done. The Fig.5 has shown

the relationship among power plant capacity and total revenue, total cost. It has been manifested that when power plant capacity will be more than 50MW, total revenue will surplus the total cost. It is the breakeven point. For the purpose of making profit it need to run the power plant at the capacity of more than 50MW.

III. ENVIRONMENTAL IMPACT

The whole world is under the threat of pollution. It includes water pollution, air pollution, soil pollution etc. The existing power plants are largely responsible for these threats. Nuclear power plant has radiation hazardousness. Dam or other structure may cause ecological imbalances. It also causes river pollution and salt pollution to the tropical area. Diesel or coal power plant emit huge amount of CO2, SO2 and NO2. These causes acid rain and harvest destruction. The emission from diesel and coal power plant is highly responsible for Green House effect i.e. global warming. Dams used in the production of tidal power can raise tide levels. Damages like reduced flushing, winter icing and erosion can change the vegetation of the area and disrupt the balance. Whereas, the sea wave power plant is free from any kind of environmental pollution. Wave energy is renewable, clean and unpolluted. There is no carbon dioxide or any other byproducts released. It doesn't produce greenhouse gases or other waste. As it is renewable, it will help reduce our reliance on the burning of fossil fuels. Wave is always available so it is reliable. IV. Swot Analysis It involves specifying the objective of the proposed power generation process and identifying the internal and external factors that are favorable and unfavorable to achieve that objective. Strengths: characteristics of the business, or project team that give it an advantage over others • It is renewable and simple in operation • Low running cost • Little maintenance • Does not hamper water navigation • Reputation in innovation Weakness: are characteristics that place the team at a disadvantage relative to others • New practice • Funding problem • Connection to electrical grid is tough Opportunities: external chances to improve performance (e.g. make greater profits) in the environment are • Profitable power business • No emission of gasses • Environmental friendly • Favorable distribution and resources • Support from media and government Threats: external lements in the environment that could cause trouble for the business or project Tsunami, tornado etc. can destroy the power generation system Power generation is not constant V. Conclusion The technology of ocean wave is still juvenile. It has been fairly possible to demonstrate a power generation plan in this paper. It has been manifested that the proposed plan of power generating from wave has some favorable distinct features which makes it possible to be renewable and eco-friendly process. Because of the simple design and easy operation it requires low maintenance cost. It requires very few operating cost that makes it the least priced power. Since it is renewable it can be an everlasting process. Its operating cost is incredibly low. Once you have built it, the energy is free because it comes from the ocean's wave power. It is important to estimate what amount of power generation will make a company profitable. For this purpose costvolume analysis has been shown (fig. 3).It will attain revenue which wills surplus total cost at 50Mw. Therefore, wave power plant can be constructed due to its sustainability, renewability, eco-friendly and friendly to the environment.

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