

Use of Waves and Tide Energy for Production Electricity in Iran

Nafiseh Ghorbani¹, Amrollah Moradi¹, Heidar Abdollahian¹ and Mohammad Ranjbar Kohan²

¹ Department of Technical Drawing, Shahr-e-rey Branch, Islamic Azad University, Shahr-e-rey, Tehran, Iran

² Department of Mechanical Engineering, Buinzahra branch, Islamic Azad University, Buinzahra, Iran

Corresponding Author: Mohammad Ranjbar Kohan, Department of Mechanical Engineering, Buinzahra branch, Islamic Azad University, Buinzahra, Iran, Email: RanjbarKohan@gmail.com

Abstract: Fossil source limits, augmenter expansion of the energy demand and most importantly the catastrophe of environmental pollution resulting from the burning of fossil materials have caused the science to apply natured recoverable energies. One of the sources of recoverable energies is the tides and the other is wave energy. Existence of long sea borders in Iran, have turned the mentioned country to one of the potentials in the region to use energy from the sea. In this article beside the examination of the methods to acquire energy from the sea, the already-done measures related to this issue are also considered and evaluated.

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1- Introduction

Fossil source limits, augmenter expansion of the energy demand and most importantly the catastrophe of environmental pollution resulting from the burning of fossil materials have caused the science to apply natured recoverable energies [3].

Marine or decanis energy, is one of the recoverable energies alongside solar and wind energies which has been considered. Waves energy and tides energy can be counted the two major marine energies. The reason why the development of these energies have been independent is in their various features and different methods to attract them [4, 5].

The tidal power planets for their similarity to water power plants and using their prepared technology have achieved quick progresses. But changes and basic alternations in the procedure is necessarily needed because of the environmental problems.

2- Kinds of Waves and Tidal Power Planets

Waves and tidal power planets have a lot of types; some are floating on the water and some are installed on the seashore. There is also a difference

in their involvement with the waves and following it the move they attract. In addition to the researches, some small samples of wave systems are built all over world and experimented upon. Figure 1 is showing a schematic of a wave power plant [5].

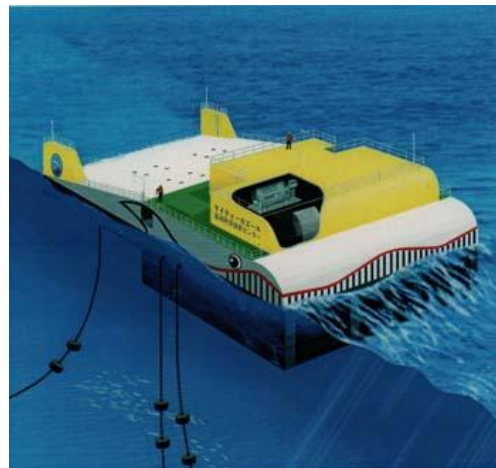


Figure1, A Schematic from Tidal Power Plants

The transition of energy from the wind to the sea creates the waves. The rate of this transition depends on the speed of the wind and also the distance which the wind had had interplay with the surface of the water. The waves carry potential energy because of the water weight transition in

regard to the intermediate sea level and carry kinetic energy for the speed of water particles. The restored energy wastes via friction, turbulence and the severest. Which depends on the waves properties and the water depth. The big waves lose their energy in the dept waters too slowly. The system/model of waves is complicated and almost often originates from local winds and the storms which wave brewed in the far distance. The waves are specified from their heights, lengths and intermittences.

Waves power is stated on the basic of kilowatt/meter which indicates the transition strength or the traverse of the energy from an imaginary line with the length of one meter and parallel to wave front. Nowadays the technology of producing energy from the oceans waves is invented and over 400 inventions are registered [5].

2-1 Using the Waves Energy

Three designs of waves energy are applied to conserve the energy [1, 2]:

Using Floating Columns

The mobile waves of the ocean pass kinetic energy. The mentioned energy can be applied to rotate a turbine. Figure 2 is showing a simple schematic of such energy switch. As shown in the picture the wave goes up in the column/capsule and it causes the air exist from the other side.

Then the moving air helps the turbine rotate which results in the rotation/operation of the generator.

When the waves go down, the air flows through turbine and once again enter the capsule through doors that are usually closed. This is, merely, one of the waves' energy producing systems.

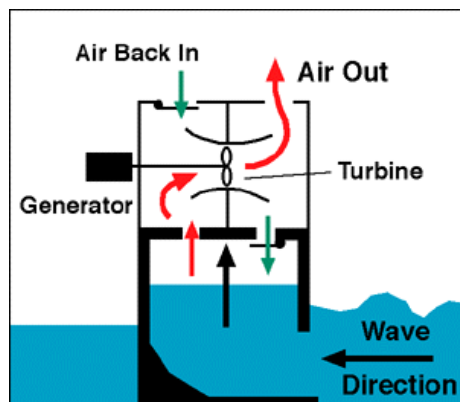


Figure 2, Schematic Image of a Wave Turbine with the Help of Floating Cylinders

Using Floating Cams

When the tide comes up, it will turn the cams and this turning movement connects to the generator. In fact the waves connect a big number of the cams together by a rod and put the device on the waves near the shores. These systems are useful for heavy waves.

Using the Drum Islands of the Drum System

It is something like an automobile tube whose rims are flexible and a turbine has been installed into the internal parts of the distributing compartments. This system is thrown into water floating around and the waves hit it. This strike hits the tube's rim and causes depression. The depression causes the condensation of the internal air. As a result, the condensed air enters a capsule from another capsule and causes the turbines to turn.

2-2 Using the Tides Energy

The sea's tides are created as a result of the moon and the sun's gravity as the earth turns. The moon's force of gravity causes the water to rise up and as a result of the earth's situational circulation, this rising flows towards the west. Consequently, waves will be created at the intervals of 12 hours and 25 minutes whose flexibility scope in the big oceans is about 0.5 meters. The effect of the sun's force of gravity is similar, but weaker and it appears once every 12 hours [5].



Figure 3, Schematic Condition of Creation of Tides

Thus, tides take place regularly in the shape of lunar waves. The highest scope of waves happen when the sun and the moon are in the same direction and the lowest takes place when they are not in the same direction. When the tidal waves

reach the continent's shores, their scope can increase the creation of resonance considerably as a result of the rush of water and the funneling of the waterway. For example, the scope of tides at appropriate places in Canada reaches as high as 10 meters. Despite the specific complications that exist in the tides, the precise anticipation and calculation in every place is possible [1, 2].

Seeking energy from the tides is practical in places where a lot of energy is concentrated in them as big tides and furthermore, the location's geography has also created a suitable site for the installation of tidal reactors. Such places can not be found everywhere. However, so far, a relatively high number of them have been identified. For the time being, few tidal reactors have been installed in the world. The first and the biggest of them is a type of single-pool and it has two effects. One with the 240

megawatt capacity has been installed in Lawrence, France which is commercial. Other than that one, the 20 megawatt reactor in Annapolis, Canada and the 400 kilowatt reactor located in Kislaygoba in the old Soviet Union and 3.2 megawatt reactor located in Jiangezia, China can be mentioned. There are also a few multi-purpose stations located in China [1, 2]. Figure 4 shows one of the methods of taking advantage of the tides energy.

When the water rises on one end of the reactor as a result of reflux causes the water to pass through the turbines and turn them. The turning of the turbines causes the generator to turn on and generate electricity.

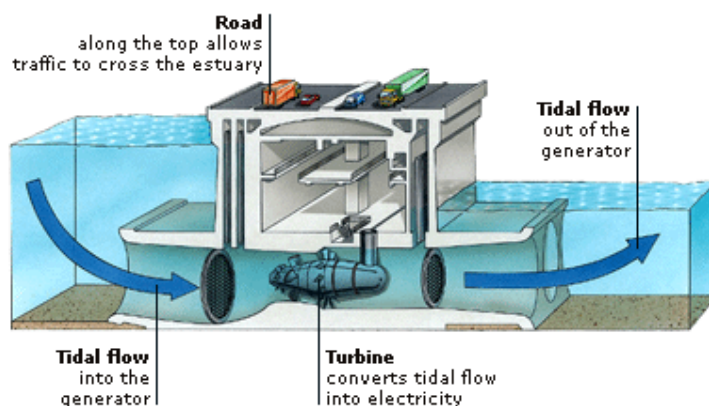


Figure 4, Shows One of the Methods of Using the Energy of Flux and Reflux

3- Projects Which Are in Process of Execution in Iran

3-1 Manufacturing Laboratory Models for Changing the Sea's Waves into Energy

This project started in 1996 and ended in 1999. The conductor of this project was Iran's New Energy Institute and the testing site was Tehran. During this project, designing and manufacturing of laboratory models for changing the sea waves' energy were tested. Coming along with the exploitation technology by taking advantage of the sea's wave around the world was researched [5].

3-2 Manufacturing an Apparatus for the Absorption of Energy from the Sea's Waves in Iran

This project was accomplished by an Iranian inventor and the assembled apparatus included a

main body and a number of arms and also a gearbox that turned linear movements of the arms into circular movements and the power of the manufactured sample was one kilowatt. The capability of doing the task in the vicinity of the waves' height was from short to tall and the regular and irregular waves were some of the advantages of this device [5].

Except for two mentioned cases, other researches and studies are being conducted in the form students' theses and other related projects. Among them, we can refer to the analysis of potential production of energy from the waves in the Persian Gulf region and the Oman Sea and or the simulation of the waves' motion on the sea and the effective factors [5].

4- Conclusion

Following the evaluation of potential studies and the possibilities of manufacturing waves and flux and reflux reactors taking into account the very high costs of operating them and their technical difficulties for which the resources cannot be justified, the accomplished activities in Iran are, merely, about the researches and, so far, no reactor has been operated for producing energy by the help of waves' energy in Iran.

We hope that as the technology advances, methods with higher efficiencies will provide the necessary conditions for building reactors in the field.

5- References

- [1] Energy Information Administration (EIA) of the Department of Energy, "Annual Energy Outlook 2003 with Projections to 2025", 2003. <http://www.eia.doe.gov/>, <http://www.eia.doe.gov/oiaf/aeo/index.html> 9.10.2003.
- [2] Energy Information Administration (EIA) of the Department of Energy, "Annual Energy Outlook 2003 with Projections to 2025", 2003. <http://www.eia.doe.gov/oiaf/aeo/assumption/download.html>, [http://www.eia.doe.gov/oiaf/aeo/assumption/pdf/0554\(2003\).pdf](http://www.eia.doe.gov/oiaf/aeo/assumption/pdf/0554(2003).pdf) 9.10.2003
- [3] Ghobadian, B., Najafi, Gh., Rahimi, H. and Yusaf, T.F. (2008) Future of renewable energies in Iran, *Renewable and sustainable energy reviews*, xxx, pp. xxx-xxx.
- [4] H Vakil, GE Global Research Center, Schenectady, NY. Subject: Capital Costs and Efficiencies of Gas Turbines. Personal communication to W. Edelstein.
- [5] WWW.SUNA.ir (Wind office-Renewable Energies Office-Ministry of Energy-Islamic Republic of Iran).

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