

Study of Underwater Windmill

Swati S. Gavali¹, Chaitanya N. Bari², Sanket S. Bechavade³, Nazish M. A. Ansari⁴

Department of Civil Engineering, Mumbai University, Mumbai- 401303.

Abstract— We build ordinary windmills to extract useful power from wind energy. We put turbines in rivers to extract useful power from downhill water flow. But in this concept we will be putting windmill underwater by using tidal energy, we can generate electricity at a huge amount. This is because water is something like a thousand times denser than air, hence producing more forces on the blades of the windmill.

Keywords— Underwater Windmill, Turbines, Nuclear fissions, intermittent energy, Tidal energy, Gravitational pull.

I. INTRODUCTION

As per the name itself "UNDERWATER WINDMILL" it is the combination of the wind mill and the way of power generation of turbine. As stated the windmill is placed below the surface of oceans the blades of windmill rotate due to the waves or the tides formed and due to its generation of electricity is done by converting the wave or tidal energy into mechanical energy. This mechanical energy is then transformed into electrical energy from the sun's heat absorbed by the surface of the ocean. This energy has a lot of applications such as electricity generation, water desalination, hydrogen production, or refrigeration and air conditioning. Both these ways and system of energy conversions are versatile.

I. PREVIOUS GENERATION TECHNOLOGIES

The generation of electricity is done at power station by electromechanical generator, primarily driven by heat engines fueled by combustion or nuclear fission but also by means such as the kinetic energy of flowing wind. Geo-thermal power is one of the other sources for generation of electricity. The first power plant used coal and today a variety of energy resources are used such as coal, nuclear, natural gas, hydroelectric, wind generator and oil.

II. NEW TECHNOLOGY DETAILS & FIGURES

A watermill is that utilizes hydropower. It is a structure that uses a water wheel or water turbine to drive mechanical process such as milling, rolling, or hammering. The rotor uses the power of the tides to generate electricity. The aim of this is to harness the energy the tide produces in a day. As the underwater turbines operate on the same principle of the wind turbines used, a flow of fluid moves a set of blades creating mechanical energy which is then converted to electrical energy. But due to the installation of the windmill underwater, it can disturb the underwater life same as that of the windmill interrupting the birds flying. Underwater turbines depend on the tides or waves for the movement of the blades, leading it to spin.

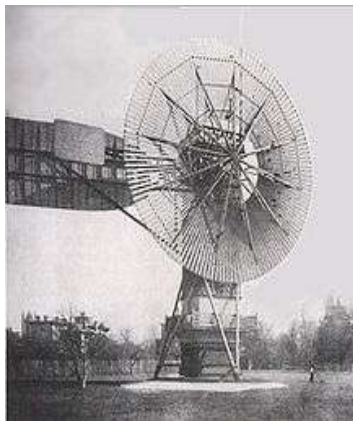


Fig. 1 WINDMILL

As the blades spin, a gearbox turns an induction generator, which produces an electric current. In addition being renewable, another advantage of oceans is that it's reliable. As sea water has high density as that of the wind ocean currents carry more energy. This has lesser impact on the environment leading to less hazardous. Water is 832 times denser than air and consequently tidal turbine rotors can be much smaller than wind turbine rotors thus they can be deployed much closer and together, still generates same amount of electricity. Ideal locations for tidal farms are close to the shore in water depths of 20-30 meters (65.5-98.5) feet. Later on the potential energy of stored water was used for powering a bulb turbine, generating electricity. Comparing with wind and wave energy both are the intermittent energy. The tidal current has some advantages due to which this energy are more attractive and is compatible with the environment. Therefore, many countries around the world are doing the research works in this field. On this basis, the tidal current energy is converted into mechanical energy and that mechanical energy into electrical energy. The converters are then categorized into main two types:



Fig. 2 Horizontal axis

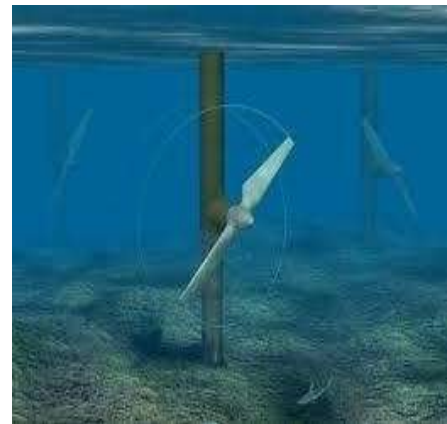


Fig. 3 Vertical axis

Many of the universities and institutions are doing research on the tidal current energy so as to reduce the environment pollution and also due to depletion of the fossil fuels, leading to the use of the renewable sources available in nature. The hydraulic system for transmission of power and generation of the same is of 5.8 kW at the current velocity of 3m/s. Although the vertical axis turbine can move in bidirectional movement, the efficiency of the vertical axis turbine is much lower than that of horizontal axis turbine. To improve the efficiency of vertical axis turbine some addition of the mechanisms are done but making the entire mechanism more complex. The issue of tidal current turbine is the stability of output power, voltage and its frequency. To stabilize the output the researchers are employing the hydraulic transmission in tidal current turbine. This exploitation of tidal current energy will eventually benefit the coastal areas or remote rural areas where there is lack of the conventional fossil fuel energy resources.

Following Countries (Plant) generates certain amount of energy:

- France - 240 Megawatts (MW)
- Canada -20 Megawatts (MW)
- China -05 Megawatts (MW)
- Russia - 00.4 Megawatts (MW)
- South Korea -254 Megawatts (MW)

New Technologies developed for tidal range power generation are tidal lagoon tidal reefs and tidal fences and low-heads tidal barrages.

III. CONCLUSION

As we know, India covers most off its part on sea shore and having command over Indian Ocean ,it have taken the resources at next level. First of all, implementing this project on smaller scale and by achieving certain benchmark India can be able to generate electricity by using tidal energy.

This concludes that this technology proves to be fairly possible to demonstrate a power generation plan. Since it is renewable and eco-friendly process it is least priced and maintenance cost is also low as it is having simple design and easy operation. Therefore, wave power plant can be constructed due to its sustainability, eco-friendly.

REFERENCES

- [1] Renewable Energy World, Ocean Energy, (2012).
- [2] <http://www.renewableenergyworld.com/rea/tech/oceanenergy> file:///l:/intro%20%20wave.html
- [3] Ocean Current's Energy, Sea Wave Energy,(December, 2011)
- [4] www.exergy.se/goran/high/re/08/ocean.pdf
- [5] US National Renewable Thermal Energy Laboratory (NERL), Ocean Thermal Energy Conversion, (February, 2012).
- [6] A. Darvill, Energy Resources: Tidal Power, (2012)