Issue 9 vol 3 ISSN: 2321-8134

IJFEAT

INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS AND TECHNOLOGY

UNDERWATER WINDMILL

V. B. Bhajbhuje[1], P. S. Malode[2], K. M. Hemnani[3], A. V. Vilayatkar[4]

[1]*Student, Civil Government Polytechnic Yavatmal, Maharashtra, India*, ***bhajbhujevaibhav2016@gmail.com***

[2]*Student, Civil Government Polytechnic Yavatmal, Maharashtra, India*, ***malodeprachi4@gmail.com***

[3]*Student, Civil Government Polytechnic Yavatmal, Maharashtra, India*, ***kritikahemnani135@gmail.com***

[4]*Student, Civil Government Polytechnic Yavatmal, Maharashtra, India*, ***avilayatkar111@gmail.com***

Abstract

Ordinary windmills are used to extract power from wind energy. This turbines in rivers (usually accompanied by dams) to extract useful power from downhill water flow. The second is more “energy intensive “ than the first, which is why we all know that dams are great sources of electrical power, while electric-generator windmills spent decades in the economic doldrums .Tidal stream turbines are often described as underwater windmills. They are driven by the kinetic energy of the moving water in a similar way that wind turbines use moving air. Underwater turbines operate on the same principles that wind turbines use ; a flow of fluid moves a set of blades creating mechanical energy which is then converted to electrical energy. Underwater turbines rely on tides to push water against angled blades, causing them to spin. These turbines can be placed in natural bodies of water, such as harbors and lagoons that naturally feature fast-moving flows of water.

Index Terms: *turbine, hydropower, marine power.*

--- *** ---

1. INTRODUCTION

The ocean has different currents at different depths. Tidal currents are being recognized as a resource to be exploited for the sustainable generation of electrical power. The high load factors resulting from the fluid proper- ties and the predictable resource characteristics make marine currents particularly attractive for power generation. This characteristic dispels the myth that renewable energy generation is unsuitable on a large scale.

The advantages offered by MCTs, it is rather surprising that this technology has not received much attention in terms of research and development. There are many fundamental issues of research and various key aspects of system design that would require investigation. A major research effort is needed in order to expedite the application of the marine current kinetic energy converters. Virtually no work has been done here.

1.1 DEFINATION

Tidal stream turbines are often turbine as underwater windmill. They are driven by the kinetic energy of moving water in similar way that wind turbines use moving air .The generator is placed into a marine current that typically result when water being move by tidal forces comes up against ,or moves around, an obstacle or through a constriction such as a passage between two mass of land. There is sufficient number of such fast flowing underwater currents around the world.

1.2 PRINCIPLE

Underwater turbines operate on the same principles that wind turbines use; a flow of fluid moves a set of blades creating mechanical energy which is then converted to electrical energy.

One advantage water places in the sea. The technology consists of rotors mount. The technology consists of rotors mounted on steel piles (tubular steel columns) set into a socket drilled in the seabed. The rotors are driven by the flow of water in much the same way that windmill rotors are driven by the wind, the main difference being that water is more than 800 times as dense as air, so quite slow velocities in water will generate significant amounts of power. The energy generated, being derived from tidesto determine the characteristics of turbines running in water for electricity production even though relevant work has been carried out on wind turbines and on high speed ships propellers and hydro turbines. None of these three well established areas of technology completely overlap with this new field so that gaps remain in the state of knowledge. This paper reviews the fundamental issues that likely to play a major role in implementation of MCT systems make this form a marine renewable energy worth pursuing.

Figure 1: Mills

It can also be defined as ,energy derived from the moon now helps to power a small arctic village .An underwater windmill like device gets power from the tides the gravitational pull of the moon produces a swift tidal current, which courses through the channel and spins the long blades of turbineshas the added significant advantage of being predictable

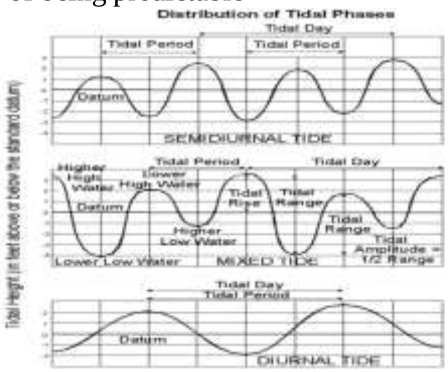

Figure 2: Table based on the formation of tides

2. WORKING

Underwater turbines rely on tides to push water against angled blades, causing them to spin. These turbines can be placed in natural bodies of water, such as harbors and lagoons that naturally feature fast-moving flows of water. As the blades spin, a gearbox turns an induction generator, which produces an electric current. Other devices can be tethered and attached to a float, such as the Evopod in England. This design allows the face of the turbine to always face the direction of the current, much like a moored boat does. Underwater windmills have a unique ability, which only a few underwater turbines in operation period contain, which is that their blades turn at right angle to the flow of water..In contrast, the Oxford team's device is built around a cylindrical rotor, which rolls around its long axis as the tide ebbs and flows. As a result, it can use more of the incoming water than a standard underwater windmill

3. DESIGN ANDCHALLENGES

There are three factors that govern the energy capture by any water current kinetic energy converter: the swept area of the rotor(s); the speed of the flow (kinetic energy is proportional to the velocity cubed) and the overall efficiency of the system. There have been many challenges to make tidal turbines commercially viable, among these has been the need to place the systems in the right locations where the water depth, current flow patterns and distance to the grid make a project economically viable, and to make units efficient and easy to maintain.

Perhaps the greatest challenge relates to creating an underwater structure with foundations capable of withstanding extremely hostile conditions. The drag from a 4.5 m/s current such as MCT's SeaGen experiences at the peak of a spring tide at Strangford is equivalent to designing a wind turbine to survive wind speeds of 400 km/h (250 mph). .In-stream technology is designed to use flow of tides to turn an impellor, just like a windmill uses the flow of air to turn its blades .Each turbine technology deal with this challenge differently ,but each uses the rotation of a turbine to turn an electrical generator.

Open Hydro and ALSTOM/Clean Current house their empellors a shroud or duct accelerate the flow of water over blades ,and improve the efficiency of the units . Marine Current Turbines uses two reversing pitch propellers ,just like a conventional wind turbines , and uses the design of there blades to maximize efficiency .

Operation

The turbines are designed to operate in the open flow of water. In the Minas Passage, they must operate in a range of speeds from zero to 8 knots, depending on where they are sited and how deep they are positioned. Water speed is fastest at the surface and slowest near the sea floor. Tidal power output is very sensitive to water speed, just as windmills are to wind speed. For example, if the water speed doubles, the turbine will produce eight times more power

4.POWER GENERATION BY UNDERWATER WINDMILL AND COST

Energy derived from the moon if used in producing energy /electricity via underwater windmill powered by the rhythmic slosh of the tides. The tidal turbines is bolted to the floor of the channel and connected to nearby town's power brigd so as to extract energy. The gravitational thug of the moon produce a swift tidal current there that causes through the channel at about 8 feet(2.5m) per second and spin the 33-foot (10m) long blade of the turbine .The blade automatically turns and rotate at a pace of 7 revolution per minute , which is sufficient to produce 700,000 kilo watt non-polluting energy per year.

The cost of installing the marine turbines is \$3m for every mega watt they eventually generates, which compares to \$2.3m per megawatt for offshore wind.

Figure 3: Power generation by underwater windmill and cost

4.1 FURTHER STUDIES

Now-a-days , a plan of hybrid mill is undergoing in UK .It consists of both the normal windmill and underwater windmill at the same place. It enables us to produce electricity via two ways i.e. using the wind power as well as tidal power; due to which production of energy will be at a larger scale.

The propellers in the windmills so designed are made in a way which rotate according to the tidal current . They face themselves towards the flowing current so that the rotation takes place easily and rapidly.

4.2 TIDAL POWER IN INDIA

Wind and solar power may get the most attention in the realm of green energy, but tidal power is slowly edging its way in Scotland ,Korea and even in New York city all have tidal projects currently underway . India joined the tidal power wave, in 2011, with the approval of commercial scale tidal power plant in gulf of kutch. The 50 Mw plant was developed by London based company Atlantis resources corporation in partnership with Gujrat power corporation and construction started in 2011. This plant was operated by 2013 making it the first of its kind in Asia , since Korea's tidal power plant was finished in 2015.

ADVANTAGES

- One of the most important and highly significant benefits of using the power of the tides is that there are no fuel costs. The energy is fuelled is by the reliable and sustainable force of the ocean . Although initial construction costs are high , the overall maintenance of the equipment and the return of power in the form of electricity can help offset this expense.
- Tidal power is also an emission free source of power, providing clean energy by harnessing this natural resource. It can be used to displace other electricity producing methods that rely on the burning of fossil fuels .Burning fossil fuels like coal, contribute to the greenhouse effect because they release poisons into the atmosphere like carbon dioxide. Sulphur is also a result of burning fossil fuels and contributes to the cause of acid rain our environment.
- Tidal power can also provide secondary benefits because transportation corridors can be built above the tidal generators .These can support roadways , water mains, rail lines or communication lines, which again can offset the expense of installing the tidal equipment.
- Tides are predictable and go in and out twice a day , making it easy to manage positive spikes.
- Its predictability makes it easy to integrate into existing power grids.
- Tidal energy is completely renewable.
- Tidal energy produces no emissions.
- Energy output is a 100% reliable, tides are as sure as the moon.
- Hidden beneath the water.
- When the tides go out gravity sucks the water through the turbines to generate electricity
- Tidal energy reduces dependency on oil reserves from other countries.

DISADVANTAGES

- The major difficulties with this type of system is that the off shore turbines cost more money than land / wind based turbines.
- They are also used to maintain as they function under water. Furthermore, sea water is corrosive to steel and other metals because of salt contain.
- Fishing has to be restricted in the areas of the power plant.
- Damages habitat up to 500km away

5. CONCLUSION

Ocean energy can play a significant role in our nation's renewable energy portfolio. With the right support, the ocean energy industry can be competitive internationally. With the right encouragement, ocean renewable energy technologies can help us reduce our reliance on foreign oil – fossil fuels, in general – and provide clean energy alternatives to conventional power generating systems. And with the right public.planning that reflects the principles of marine biodiversity. .

Tidal energy has potential to become a viable option for large scale, base load generation in Scotland. Tidal Streams are the most attractive method, having reduced environmental and ecological impacts and being cheaper and quicker installed.

Development of a robust offshore renewables industry can:

- Reduce reliance on foreign oil.
- Rely upon ocean terrain for power generation as opposed to onshore land resources.
- Revitalize shipyards, coastal industrial parks and shuttered naval bases.
- Create jobs in coastal communities

REFERENCES

1) **ww.google.com**
2) **www.wikipedia.com**
3) **www.studymafia.org**