

## A Review on Underwater Windmill

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### ABSTRACT—

As the need for residential and industrial activities rises, so does the requirement for energy. The source of the energy should come from sources of renewable energy as opposed to non-renewable ones. In the present, governments are focusing mostly on developing renewable energy. Most of them involve slow, laborious processes. But employing underwater windmills, tidal energy can quickly produce electricity. This research paper shows that underwater windmill energy generation, including its forms, technologies. By changing the design, materials, and environment, this technology can overcome its difficulties.

**KEYWORDS:** renewable energy, tidal energy, windmill, non-renewable energy.

### I. INTRODUCTION

The challenge of energy production in the current day is that energy demand is rising quickly, which leads to an increase in global warming. Energy can be produced using a variety of techniques, including thermal, coal, hydroelectric, geothermal, and biomass. Both renewable and non-renewable resources are included. Sources of renewable energy are:

#### i. Solar energy:

Due to their inexpensive installation costs and other money-saving advantages, rooftop solar panels are growing in popularity these days. Solar panels, an assembly of photovoltaic cells (also known as solar cells), an inverter, AC/DC switches, and electrical conduit are needed to install a rooftop solar system. Building roofs may simply be equipped with rooftop solar panels to capture solar energy.



**Fig-1: Installation of solar panel**

#### ii. Wind energy:

Smaller wind turbines are typically used in buildings to provide electricity. It operates on a

straightforward premise: wind turbines generate power from wind, as opposed to utilizing electricity to create wind, like a fan. A turbine's blades, which resemble propellers, rotate around a rotor, spinning a generator to produce power. In contrast to huge commercial wind turbines, small wind turbines, usually referred to as micro wind turbines, are used to generate little amounts of electricity. Your electricity expenditures can be cut by 50% to 90% with small wind electric installations.



**Fig-2: Small wind turbines**

#### iii. Geothermal energy:

Geothermal energy is the earth generated at the Earth's core. Geothermal energy can be used to generate heat and electricity. It is a clean, renewable resource. Heat generated by the Earth itself is known as geothermal energy.

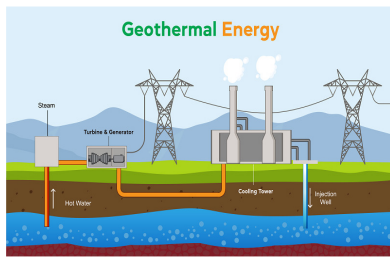


Fig-4: Installation of geothermal energy

**iv. Tidal energy:**

It is also a renewable energy powered by the natural rise and fall of ocean tides and currents.



Fig-3: Tidal energy

**UNDERWATER WINDMILL:**

Basically, the name underwater windmill called as putting a windmill in the water. It is device that extracts power from the tides; renewable energy technologies are becoming an increasingly favorable alternative to conventional energy sources to reduce fossil fuel related issues. Providing a plentiful and dependable energy source is tidal energy.

This technology is like wind energy technology, with the motor blades driven not by wind power but by tidal currents. They are cheap and do not damage the environment. The gravitational pull of the moon produces a swift tidal current, which spins the long blades of the turbine. This in turn generates electricity using various underwater windmill components.

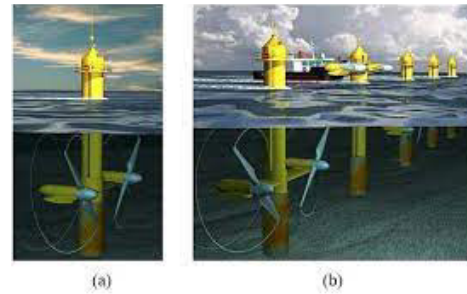


Fig-4: Front view of underwater windmill

**PARTS OF UNDERWATER WINDMILL:**

There are five major parts of a windmill. They are:

1. Turbines
2. Gearbox
3. Generator
4. Cables
5. Supports

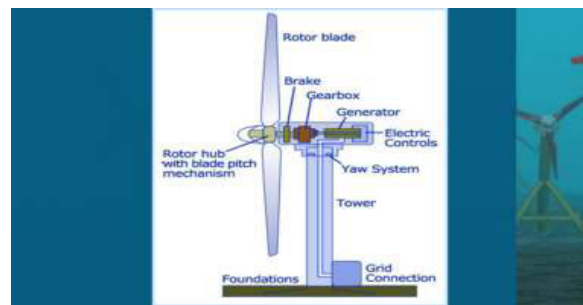


Fig-5: Thematic diagram of underwater windmill

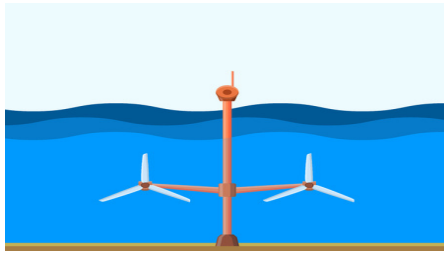
1. **Gearbox:**
  - To control the speed of turbine.
  - It has high gear ratios
  - It produced high torque output
2. **Generators:**
  - AC generators are commonly used.
  - Induction generator.
  - Permanent magnet synchronous generator

**TYPES OF UNDERWATER WINDMILLS:**

There are two different types of underwater windmill. They are:

- a. **Horizontal axis or transverse direction:**

In horizontal axis, the arrangement of rotor shaft can be done parallel toward the water flow direction.



**Fig-6: Horizontal or transverse axis windmill**

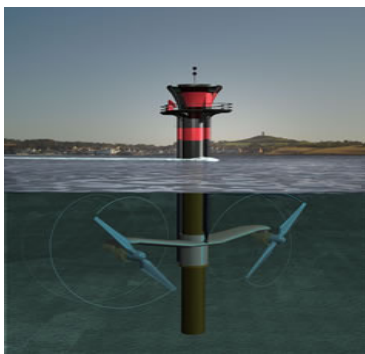
**b. Vertical axis:**

In this axis, the arrangement of rotor shaft can be done perpendicular towards the flow of water direction.

**WORKING PROCEDURE FOR UNDERWATER WINDMILL:**

When water flows, the rotor rotates to make the generator turned ON. The gearbox is used to convert the rotor shaft's rotational speed to the generator's selected output speed.

By using the cables, the electricity produced can be sent to the ground. Kinetic hydro energy can be converted into power by the turbines. Underwater windmill includes several blades that are arranged on a hub, a generator & a gearbox.



**Fig-7: Underwater windmill**

The rotor, which is connected to a generator by a gearbox, can spin as a result of the hydrodynamic effect of the water flow. The gearbox's primary function is to convert the rotor shaft's rotational speed to the generator shaft's

preferred output speed. Cables can be used to transport the generated electricity inland.

The system will be impacted by the following aspects in an underwater windmill.

- Cavitation avoidance or bubble formation
- Corrosion resistance

**ADVANTAGES OF UNDERWATER WINDMILL;**

- Less maintenance and gives more life-time
- The underwater windmill uses tidal energy and this is a clean & renewable energy source.
- Decreases the dependence on fossil fuels.
- It has less impact on the environment.
- Running cost is very less.
- It is placed under the water.
- No fuel cost

**CONCLUSION:**

The numerous studies and in-depth details regarding the various characteristics on underwater windmills in this page indicate that it has a significant potential to be become a significant source of energy in future. In several European nations, underwater windmills are primarily used very good source of energy generation. India is another country with a bright future for underwater windmills.

Tidal plays a very important role in the formation of global climate as well as the ecosystems for ocean habitats. Depleting oil reserves, the emission of greenhouse gases by burning of coal, oil, and other fossil fuels, as well as the accumulation of nuclear waste.

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