

Multi Propeller Vertical Wind Mill

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Abstract-Engineers and environmentalists are pursuing the utilization of renewable energy in lieu of ever the increasing demands for electricity. Our generation has inherited the charge for finding a solution to society's growing needs. Capturing wind energy was first conceptualized in 1888 by Charles. F. Brush, and has evolved into large scale wind turbines and generators known today. However, a small scale system for exploiting wind energy has eluded mass production, when it could realistically be implemented into our everyday lives. Through our daily tasks, society loses kinetic energy to the environment; a small scale wind turbine will streamline energy efficiency from a renewable source. Our goal is to design multi propeller that will suit an aesthetic residential sized wind turbine that will perform well in a non-commercial environment and be easy to expand to a whole system.

Key Words: Multi Propeller, Vertical Axis Windmill, Renewable Energy, Wind Powers

1. INTRODUCTION

1.1. History

Wind powers uses have dated back as early as the first sailboats to navigate vast seas and oceans in the worlds early ages of exploration. The United States entered the industry in 1854 with the first manufactured windmill designed by Daniel Halladay [1]. His work was heavily relied on during Westward expansion, when water required for steam engines was scarce. More than 6 million windmills were installed between 1850 and 1970 in the United States.

1.2. Mariah Windspire

The Mariah Windspire is an attempt at redesigning the classic windmill design. It features a tall and slender vertical axis, mounted on a short tower. There are three vertical blades shaped similar to airplane blades, which rotate about the center axis. Although the idea was ingenuitive, the Windspire could not deliver the required output to justify itself as anything more than an aesthetic accessory [2].

1.3. Quiet Revolution

The Quiet revolution vertical axis wind turbine (VAWT) features three airfoil blades in a helical twist design. The unique design distributes the torque evenly over the

revolution to negate destructive pulsations. The early poor performance of the QR5 has been credited to poor placement [2].

1.4. Windbelt

The device harnesses wind power by intentionally inducing aeroelastic flutter. Wind belt is designed to work under low wind speeds of three to twelve meters per second. The device is designed to provide power to remote locations in the developing world. A scaled down version, called the microbelt, is up to ten times more efficient and planned to be used to power IOT devices [3].

1.5. Dragonfly

The Dragonfly is a compact wind turbine, designed by an Italian Architect who was inspired by the physics of a dragonfly. Its unique two blade design can harvest winds blowing as slow as four miles per hour. The traditional turbine use either specifically designed blades that stall at high systems or computerized systems that have wind speed sensors that modulate the angle of the blade in response-which is too expensive to offset costs associated. The dragonflys design is ultra lightweight, allowing it to harness the slightest of breezes [4].

1.6. SheerWindInvelox

This wind turbine is capable of producing 600 times the power of a normal turbine. It is designed to take ground level winds and funnel them inward. This process accelerates the wind speed so it can function at times of low wind. Being a simpler design than most windmills it is also cheaper to build than most of its competitors [5].

1.7. Wind-Hydro Hybrid

The wind-hydro hybrid is a wind turbine that combines the power of wind and hydroelectricity. This is the only turbine that could generate power when there is no wind because of the electricity that comes from the hydro part of the turbine. The first ones are set to be located in the forests of Germany and will have a capacity of about 13.6 megawatts [6].

1.8. Darieus Wind Turbine

Darrieus wind turbine - A darrieus wind turbine can spin at many times the speed of the wind hitting, hence the

turbine will create only less torque than a savonius but it rotates much faster. The Darrieus wind turbine is a type of vertical axis wind turbine used to generate electricity from the energy carried in the wind. The turbine consist of a number of curved aerofoil blades mounted on a vertical rotating shaft [7].

1.9. Vortex

The Vortex wind turbine has a straw shaped bladeless design. The turbine is designed to harness energy by exploiting the aerodynamic effect vorticity. The vortex uses the vibrations caused by vorticity in conjunction with a base of repelling magnets to generate electricity. The device in theory should have low maintenance costs because there are very few moving parts. The turbines can be placed closer together than conventional turbines are totally silent and cost less to manufacture. Vortex is also no danger to birds [8].

1.10. Typhoon

The Typhoon is an eggbeater shaped wind turbine designed to harness the massive amount of energy potential of typhoon storms. It is much more durable than conventional three blade turbines because of how compact it is. The design utilizes the Magnus effect and allows for wind from any direction to be harnessed. The device is designed to fit the energy needs of Japan, a country regularly hit by typhoons [9].

1.11. Makani Airborne Wind Turbine

This airborne turbine can reach stronger and more consistent winds not available on the ground. It could be deployed over the mainland us or over deep offshore waters. which could lead to access to a renewable energy resource four times greater than the entire country's electrical generation capacity [10].

1.12. Compound Rotor System

US Patent 8777557 Introduced a compound rotor system to increase the capabilities of wind turbines. The second rotor allows for the system to efficiently generate electricity from low wind speeds [11]. This increased capability allows for the system to be effectively deployed in a larger array of locations [14].

1.13. WhalePower

WhalePower has redesigned the props for typical wind turbines to mimic the bumps (tubercles) found to the bumps on a humpback whales fins. This evolutionary feature found in the wild helps whales to prevent a stalling effect with their fins as they glide through the ocean. The steeper the tilt on the blade, the more there is potential for power generation. Steeper angles however also increase the risk of stalling. Studies show that

implementing bumps into a prop could increase the production for wind farms by 20 percent [12].

1.14. Mageen Air Rotor System (MARS)

It is a high altitude wind turbine that stays a float with helium-filled airship like body. It can be tethered up to 1000 feet in the air. MARS rotation generates electricity, which is transferred down the power line, which doubles as its tether, to the ground. MARS is still being tested [12].

1.15. WePOWER

It is a vertical-axis wind turbine that operates quietly and performs well in low speed winds. Unlike many turbines which either rely solely on lift or drag, WePOWER uses a combination of both. Its unique airfoil lets its produce power at low wind speeds. WePOWER turbines are mainly used in wind farms, homes, cell towers and buildings [12].

1.16. Spiral Drag Wind Turbine

The vertical axis turbine uses drag propulsion to push the blade that is designed as an involute spiral. The turbine uses aluminum vanes formed into an involute spiral giving the blade extremely high surface area to capture wind and rotate. This design is still in developmental stage [12].

1.17. Helium Filled Floaters

The world's first airborne wind turbine launched in 2014 over Fairbanks, Alaska. Held aloft by helium like a giant cylindrical blimp, built by MIT startup Altaeros Energies to float 1,000 feet in the air and capture wind currents five to eight times more powerful than the breezes at ground level. Since its this high it can transmit WiFi, and cell signals during the bad weather [13].

1.18. Wind Harvester

This reciprocation motion based turbine uses horizontal aerofoils similar to those on airplanes. It is noise free, works at relatively low speeds, and easy to install. It will also be operational at higher wind speeds than current wind turbines [13].

1.19. Windstalk

Within each hollow pole is a stack of piezoelectric ceramic discs. Between the ceramic disks are electrodes. Every other electrode is connected to each other by a cable that reaches from top to bottom of each pole. One cable connects the even electrodes, and another cable connects the odd ones. When the wind sways the poles, the stack of piezoelectric disks is forced into

compression, thus generating a current through the electrodes [13].

1.20. Windbeam

Windbeam is a micro generator capable of generating energy from wind speeds as low as two miles per hour. Vortex shedding and transverse galloping cause oscillations in a beam which are then harnessed through an electromagnet induction system. Windbeam is designed to work with low power devices such as HVAC duct sensors and other internet of things devices [15].

2. METHODOLOGY

The specific goals represented by my efforts are summarized in the abstract. My extended goals focus on user profitability, positive environmental impact and self sustainability.

The design process begins with a needs assessment:

- Increase the quality of life by providing a source of renewable, clean energy.
- Improve on previous large scale wind turbines by creating a system used by the civilians.
- Provides commercial incentive for members of the public to invest in personal renewable energy, generated and used by them.

Once a need is discerned, the following problem formulation is in order. Large wind turbine systems lack mobility and are costly to fund, most of which are company maintained. A small scale version could go with the user, and the user would directly benefit from its use. The vision at hand is for an individual to be self sufficient, if not at least supplemented.

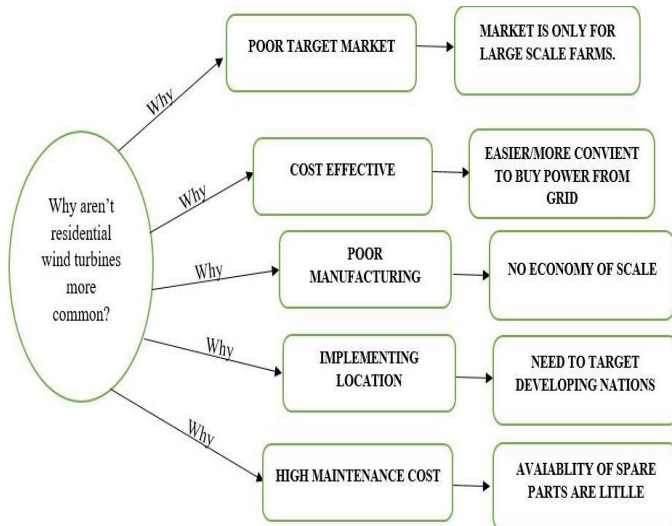


Fig: 1 Problem formulation

3. EPICYCLIC GEAR SYSTEM

The epicyclic gear system consist of three planet gears and a centerly connected sun gear .For our design model the outer ring gear is fixed and the sun gear is allowed to rotate along its axis. The shaft from the sun gear is connected to the shaft of thegenerator. For each planet gears a propeller is interconnected with it . The size of the gear depends on the size of the propeller used

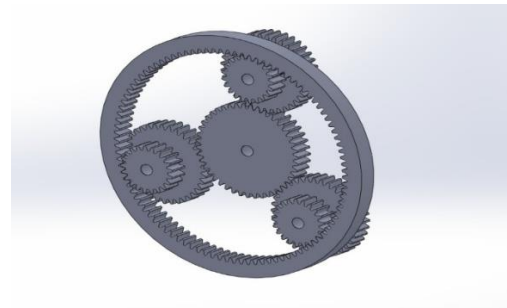


Fig: 2 EPICYCLIC GEAR

4.FINAL PROPELLER DESIGN

The yields of our product depend on the amount of wind available at a given point in time. Only through testing can we accurately estimate the output available. Our goal to make the product as cost effective as possible will encourage sales. The consumer should see logic in paying the upfront cost to yield long term savings. The user will need to check their local requirements for structures, particularly in suburban areas. Our device will be compact enough to mount atop a home, and should not result in any negative forthcoming. However, a permit may be required depending on local jurisdiction. The final product will be simple enough for the user to perform self maintenance, and not require a technician. We would offer a start up installation, and optional maintenance package if desired.

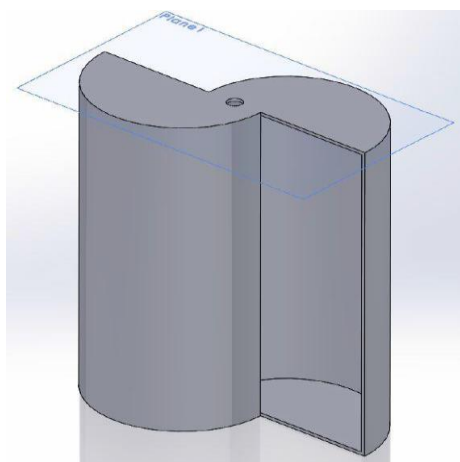


Fig: 3 Final Propeller Design

4.1.FINAL PRODUCT

The final product is the combination of the epicyclic gear and the propeller .As we are required to use multi propeller , each of the same type of propeller is fitted to each of the planet gear , thus by means of wind power the propeller rotates with the gear which makes the rotation of sun gear to generate energy .

5.CONCLUSION

Final design, which will quench the need for an alternative energy solution available on a residential level. Looking forward, our windmill's uses could be expanded to government highways, commercial high rise buildings, schools, beach fronts, etc. The possibilities are only as limited as the creativity of the user-wind envelops the human race daily. The solution to our energy supply worries has blustered mankind preceding electricity. America's pursuit of wind energy began with large scale government wind turbine farms in the wild west, and now an individual can self-supplement at every street corner and cul-de-sack.

REFERENCES:

- [1] Patrick Ames Daniel Halladay, the man behind the wind engine <https://prezi.com/vdjzzjxpx2a6/daniel-halladay-the-man-behind-the-wind-engine/>.
- [2] Paul Gripe Wind-Works: Mariah Windspire <http://www.wind-works.org/cms/index.php?id=551>.
- [3] Physics.org Reinventing Wind Power <http://www.physics.org/featuredetail.asp?id=47>.
- [4] Nina Azzarello wind turbine designed by Renzo Piano <https://www.designboom.com/technology/dragonfly-invisible-wind-turbine-designed-by-renzo-piano-10-23-2013/>.
- [5] Sheer Wind Changing the Course of Power Generation <http://sheerwind.com/>
- [6] Max Boegl Wind-Hydro Hybrid <https://www.gerenewableenergy.com/stories/wind-hydro-hybrid-power>.
- [7] Willy Tjiu, TjukupMarnoto, SohifMA, Mohd Ruslan, Kamaruzzaman Sopain Darrieus vertical axis wind turbine for power generation I: Assessment of Darrieus VAWT configurations <http://www.Sciencedirect.com/science/article/pii/S096014811400603X>.
- [8] Eliabeth Stinson. The Future of Wind Turbines? No Blades <https://www.wired.com/2015/05/future-wind-turbines-no-blades/>.
- [9] Harumi Ozawa Japan scientist eyes energy burst from 'typhoon turbine' <https://phys.org/news/2017-03-japan-scientist-eyes-energy-typhoon.html>.
- [10] TsvetomiraTsanovaMakani produces 1st power with 600-kW kite <https://renewablesnow.com/news/google-x-produces-1st-power-with-600-kw-kite-569167/>.
- [11] SAMENVATTING Compound rotor system of wind energy conversion system (WECS) and WECS <http://www.google.sr/patents/US8777557>.
- [12] Lisa Merolla 10 Wind Turbines That Push the Limits of Design <http://www.popularmechanics.com/science/energy/a4428/4324331>.
- [13] Derek Markham The Future of Wind Power: 9 Cool Innovations <https://www.treehugger.com/wind-technology/future-wind-power-9-cool-innovations.html>.
- [14] Zhang, Yulong Compound rotor system of wind energy conversion system (WECS) and WECS <http://www.google.sr/patents/US8777557>.
- [15] Ian Wright An Alternative Approach to Alternative Energy <http://www.engineering.com/BIM/ArticleID/11975/Windbeam - An - Alternative - Approach - to-Altern>.
- [16] Physics.org Reinventing Wind Power <http://www.physics.org/featuredetail.asp?id=47>.
- [17] Seki, Kazuichi, Yoshio Shimizu, and Yoshio Kato. Vertical Axis Wind Turbine.GakkoHijin Tokai University, assignee. Patent US4247253 A. 27 Jan. 1981. Print.