The Next Generation Windmill

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Abstract— Innovative ideas of flying air machine has been acquainted with take up the bigger greatness and more steady speed with low irregularity at higher height in the atmosphere. "The NEXT GENERATION WINDMILL" is the up and coming era of twist turbine with impressive cost and superior over existing frameworks. It is the air fastened wind swell that pivots evenly in light of the wind. Helium Sustains the framework to a tallness with the assistance of the pressure sensor. My paper recommends a contrasting option to beat the disadvantage of existing framework. The disservice of air borne framework is briskly given .There are odds of broken association between flying inflatable and ground framework. The consideration of Controller wing and bolting framework get past the detriment.

Key words: Windmill

I. INTRODUCTION

In the developing science and innovation, renewable vitality put an essential part. The creation of different renewable vitality like Tidal, Wind and Solar has demonstrated a shelter to humankind. In this paper the power era utilizing renewable vitality with ECO agreeable system is examined. The extent of this venture is to dispense with the impracticable of kite-based frameworks and cutting edges by making a recoverable, adaptable, easy to use unmanned flying vehicle (UAV) utilizing Helium inflatables.

Routine wind vitality authorities which incorporates Horizontal hub machines like dutch sort wind plant and vertical hub machines like Darreus rotor.

Disregarding different preferences these machines experience the ill effects of different disservices like self-ruling retraction. My paper recommends about the disposal of fastened wing and it is supplanted with helium filled inflatable

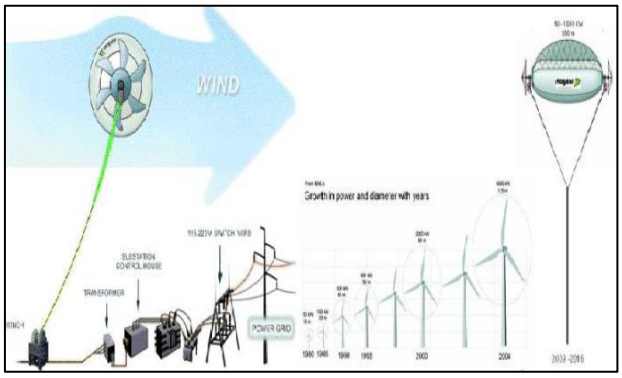


Fig. 1: Working of Floating turbine

II. AIR ROTOR SYSTEM

Air Rotor framework depends on the standard of Magnus Effect has been proposed and elevate of Helium gas producing 4 kW appraised power.It would be moored by the tether that can broaden upto 1000 feet from ground.A tallness of 400 feet can get the twist at the speed of 3 m/s ,The inflatable twists noticeable all around turning the generators. The pivot balances out the inflatable while the vitality is exchanged to the ground through the inflatable,

The Air Rotor System is a lighter than air fastened wind swell that pivots about a level hub because of wind, creating electrical vitality. The electrical vitality is to be exchanged down the 1,000 feet tie for prompt utilize, or to an arrangement of batteries for later utilize, or to the power network.

Helium gas manages it and permits it to climb to a higher elevation than customary wind turbines. It catches the vitality accessible at the 600-1000 feet low level and nighttime fly streams that exist all around. Its revolution likewise creates the Magnus impact which gives extra lift, keeps it balanced out.

III. MAGNUS EFFECT

A spinning object is moving through the fluid departs from its straight path because of the pressure differences that develop in the fluid as a result of velocity changes induced by spinning body.The Magnus effect is the manifestation of Bernoulli's theorem fluid pressure decreases at points where the speed of the fluid increases.In case of ball spinning through the air,the turning ball will drag some of the air with it.Viewing the position of the ball ,the air is rushing by all the sides.The drag of the side of the ball turning into the air retards the air flow whereas the drag on other sides speeds up the air flow.A large object similar to that of the air rotor creates substantial lift, so much so that the device should actually work in a wind stream, without using a lifting gas like He.

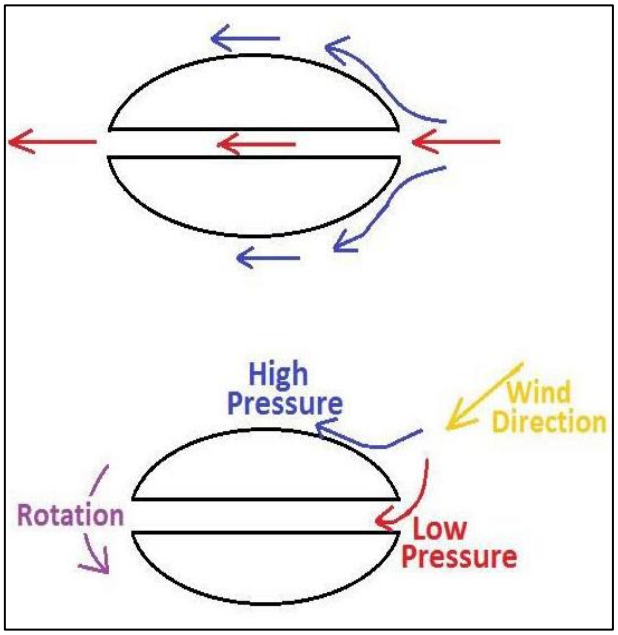


Fig. 2: Diagrammatic Representation of Magnus Effect

IV. LEAST DRAG GEOMETRIC SHAPES

From the recorded figures, we pick the "elliptical pole" this shape will help us to keep up minimum drag condition and movement, however, this drag condition alone is not adequate for keeping inflatable stationary and subsequently we formulated an examination in which we created an opening in focal point of the inflatable going through its horizontal pivot which permits air to go through. The nearness of opening keeps up the inflatable in a stationary position for a longer time frame as the wind will dependably attempt to take the easiest course of action i.e. it will dependably attempt to go through the entry and henceforth the inflatable will dependably confront towards the course of wind.

The investigation was setup in a subsonic wind burrow and the outcomes acquired were sure. We have kept the inflatable in different introductions when the wind passage was exchanged on the inflatable situated itself in course of the wind and further revolution was smothered. The pivot and arrangement of the inflatable with the course of wind was the weight distinction between two unique sides of the inflatable. This is a direct result of the nearness of a section of twist through the opening in the inflatable which brings down the pressure next to its by increasing the wind speed and hence it rotates the balloon in the opposite direction to stabilize the pressure.

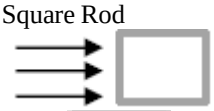
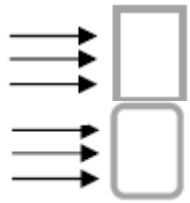
S.no	Body	Status	C_D
1	Square Rod 	Sharp Corner Round Corner	2.2 1.2
2	Circular Rod 	Laminar flow Turbulent flow	1.2 0.3
4	Rectangular Rod 	Sharp Corner Round Corner	1.3 (L/D=3) 2.5 (L/D=0.5) 0.7 (L/D=4) 1.2 (L/D=0.5)
5	Elliptical Rod 	Laminar flow Turbulent flow	0.6 (L/D=2) 0.25 (L/D=8) 0.2 (L/D=2) 0.1 (L/D=8)

Table 1:

V. HELIUM GAS USE

The air rotor is filled with He gas, which is inert and non-flammable. The lifting Helium gas creates a lift force that is in excess of the total weight of the system. The He gas provides at least twice the positive lift compared to the overall weight of the unit. The spinning of the rotor creates an additional lift.. The aerodynamic effect that produces additional lift is the Magnus Effect.To keep rotor at an altitude,the helium gas plays a major role. The gas is also plentiful, inexpensive and environmentally safe.

The combined lifting effect from the buoyant He lift and aerodynamic Magnus lift helps to stabilize the air rotor against leaning in the wind. Based on the test done, an air rotor went straight up and held a near vertical position in various wind speeds, as the Magnus effect increases as the wind speed increases. Maximum lean is expected to be less than 45 degrees from the vertical.

The 4 kW rated power unit would requires slightly over 6,000 cubic feet of He. Helium leaks at a rate of 0.5 percent per month or 6 percent per year, therefore the air rotor units will have to be topped up with He every 4-6 months.

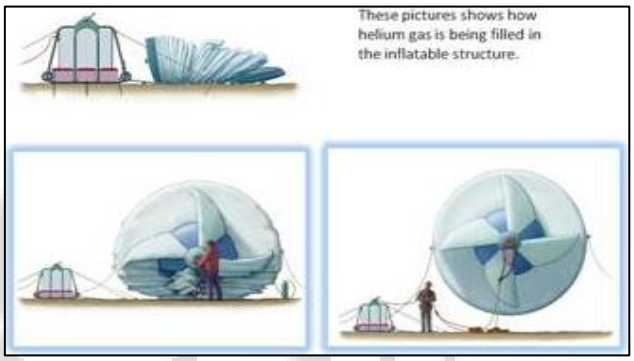


Fig. 3: Helium inflated balloon

VI. POWER GENERATION

In the presence of high winds, floating rotor is capable of exerting a traction force equivalent to several hundred kilo Newtons, moving at speeds that can exceed 80 m/s. The product of the force multiplied by the speed provides to the order of magnitude of the potential power generated by the kite:

$$P = F \,.V \qquad \text{[Eq--1]}$$

A single balloon has the theoretical potential at a speed of 80 m/s and a force of 100,000 Newtons of generating a power of:

$$P \approx 100x10^3.80 \approx 8x10^6[\text{Watt}] = 8[MW] \qquad \text{[Eq--2]}$$

which exceeds the rated power of existing horizontal axis wind turbines at 7 MW.

The floating wind generator can be envisioned as a giant carousel, solidly anchored to the ground. Its nucleus consists of a central structure, tall enough to support the arms by means of a tenso structure. This carousel is put into motion by the wind itself that drag the wind rotor out from their funnels within the arms, and into the sky. The rotating central structure contains the automatic winches that control the pairs of cables of thousands of meters in length.Cables made of high strength materials such as Dyneema have a tensile strength that is capable of holding 30 tons/cm^2, and these cables weigh just 100 kg/km.The applications of the air floating rotor are stated,Off grid for cottages and

remote uses such as cell towers and exploration equipment); Developing nations where infrastructure is limited or nonexistent;Rapid deployment (to include airdrop) to disastrous areas for power to emergency and medical equipment, and relief efforts (ex. Katrina, Tsunami) and military applications.

VII. BALLOON DESIGN

The inflatable is planned in a manner that it ought to tend to change its shape with the stream of wind.Here we utilize the inflatable with carbon skeleton framework above which polyester sheets are connected as the envelope,we have given a different layer of same material to keep spillage of helium gas from the balloon.Even after this various layers of course of action, there is a probability of leakage.To forestall it pressure sensor is fitted which will screen the weight Once the weight comes to beneath the maximum furthest reaches of the lift, the helium pressurized gas container will be encouraged with an order by the weight sensor and after that helium will be refilled in the inflatable. For around 30 - 50 days,this whole framework will keep the inflatable noticeable all around. This inflatable is composed in such way that it can be refilled and reused.[5]

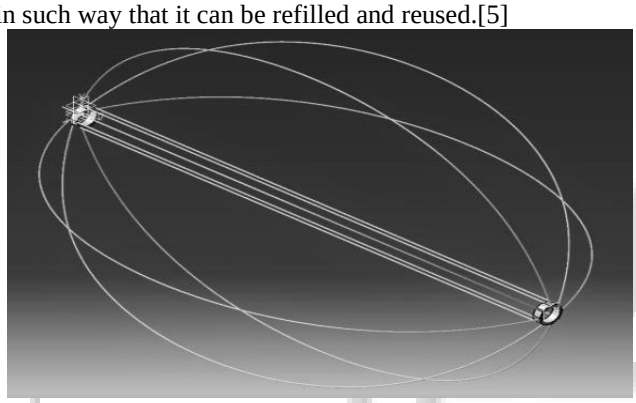


Fig. 4.1: Cylindrical balloon Skeleton

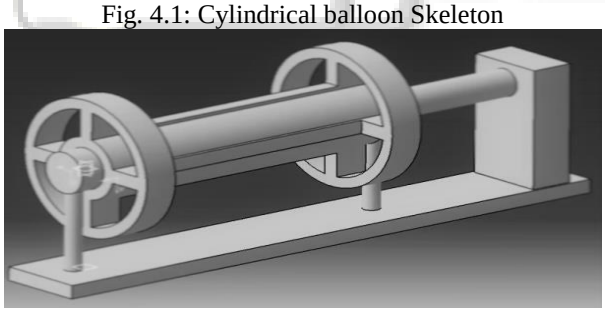


Fig. 4.2: Tethering system

VIII. CONSTRUCTION AND WORKING

The wind turbine is a lighter-than-air tethered wind turbine that rotates about a horizontal axis in response to wind, generating electrical energy. This electrical energy is transferred down the tether for consumption.

A. Cylindrical Balloon

The balloon is cylindrical in shape and is filled with helium air which is lighter then air, hence it could be placed above 300m height.

1) Wind Vane Stabilizer

It is one of the important parts of the air borne turbine. It restricts the turbine in horizontal direction, and gives stability to the balloon.

B. Axle

It acts as a frame of turbine which is a single shaft connecting the balloon, and aluminum tube to the generator shaft, hence it is the power transferring element of the air floating turbine.

C. Generator

It the actual machine which converts the rotary motion into electrical energy. There are two conventional generator used for power generation. And transfers power to the base station unit.

D. Pressure Sensors: (inside the balloon)

Pressure sensor will keep a track of pressure drop and reduction in the gas quantity within the balloon. Once the weight comes to underneath the maximum furthest reaches of the lift, the helium pressurized gas bottle will be fed with a command by the pressure sensor and then helium will be refilled in the balloon. For approximately 30 - 50 days,this entire system will keep the balloon in the air. This balloon is designed in such way that it can be refilled and reused.[5]

E. Locking System

Once the pressure has reached below the upper limit, The pneumatic brake system will be activated to stop the balloon rotation. The position of the balloon will be retained by .inflating the balloon.

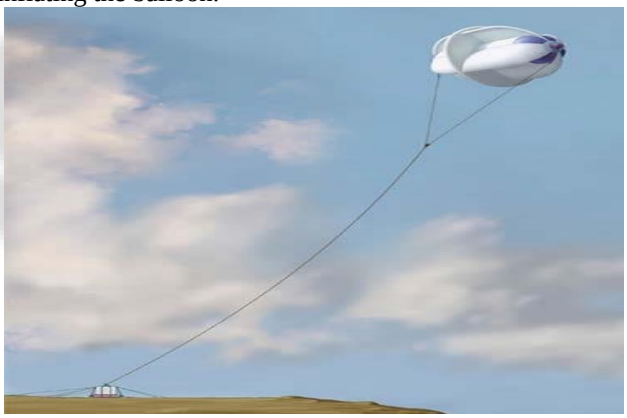


Fig. 5: Flying Wind Mill

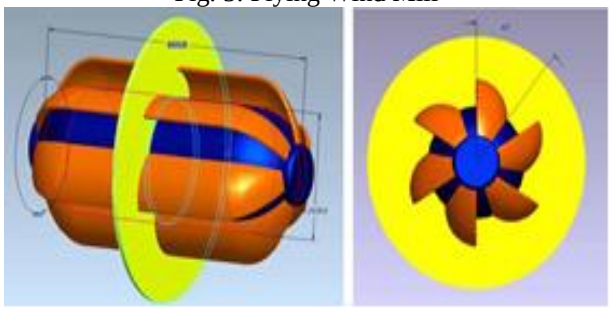


Fig. 6:Cylindrical balloon

IX. COMPARISON WITH HORIZONTAL TURBINE

The wind rotor cleared territory is highly worried for a level plate wind turbine. In the instance of the wind rotor, one can expand the measure of the rotor at little cost and better monetary effectiveness per unit of swept area. The air rotor can work at a speed more prominent than 28 m/s. Thus the unit utilizes the Magnus effect. The structural integrity plays a vital role in maximizing the speed. The air rotor size is

specifically relative to the speed capability. The excessive speed is controlled by moderating the tether height.[2]

The collapse is normal on all airships is a crisis framework that would be utilized on the off chance that it for reasons unknown the rotor broke free or other extraordinary crisis.

The generator supports the axle ends but below the axle, they act as tether anchor points. The inclusion of simple gear system increases the rotation speed.

X. SPECIFICATIONS OF 4 KW AIR TURBINE

EQUIPMENT	WEIGHT
Balloon	4 kg
Helium Refilling System(27CF, 1800psi)	3 kg
Tethered rope (Kevlar, 450Kg tensile strength)	4.46 Kg per Km
Start up wind speed	1m/s
Rated wind speed	12.5 m/sec
Rated Power	4000 Watts

Table 2:

XI. RESULTS AND DISCUSSION

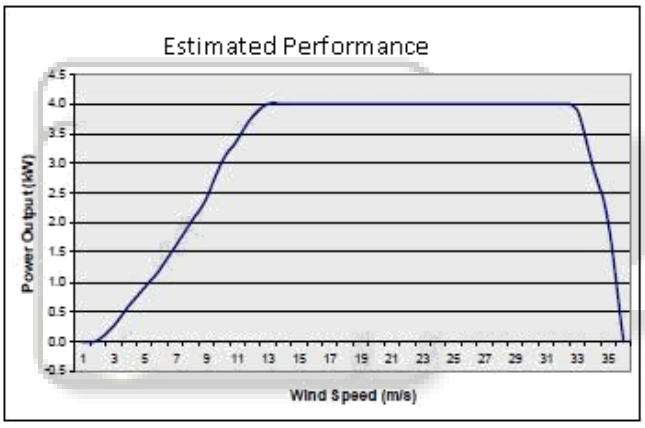


Fig. 7: Simulated graph power output Vs Wind speed

Fig 7 The Simulated graph is obtained from the software CATIA V5.From the graph it is verified that the power output of the floating air balloon increases exponentially as the wind speed increases.As the flow of wind is considerably high at higher altitude.

XII. CONCLUSION

Helium filled balloon is very simple to install. Despite of its larger size, no cranes are required to deploy the system. High-altitude wind power using tethered wind turbine devices has the potential to open up a new wind resource in areas that are not served by conventional turbines. Thus the possibility of broken connection is rectified by the locking system been introduced.

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