

REVIEW PAPER ON WATER PUMPING SYSTEM USING WINDMILL

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Abstract- In our review paper of development of wind-powered water pump by I.F Odesola, L.G Adinoyi, a HAWT with three rotor blades with a maximum pump head of 0.3m to reduce other obstructions to motion just like friction. A three performed evaluation test was carried at every 20 minutes time sections. Performed test of the development wind pump revealed an ample discharge flow rate in the range of 3.4 to 6.44 l/min for irrigation purpose. In another research, renewable and sustainable energy reviews, wind powered utilization for water pumping using small wind turbines in Saudi Arabia, annually there is 30,000m³ total water pumping capacity and is done from a depth of total dynamic head of 50m, hub height 15-40m, at all three sites with total cost of water pumping is 1.28 US \$/m³

Keywords: Windmill, Wind turbine, Renewable energy, Water irrigation, Horizontal axis

INTRODUCTION

Water pumping is extremely vital, most elementary widespread energy wants in rural areas of the globe. Water supplies like wells, dugouts, rivers can often be used for agricultural fields. However, due to limited availability of power supplies or resources some alternate form of energy has to be used to supply water from source to point of consumption. Wind energy is an important source of renewable energy that can be used for pumping water in far-off locations. A wind pump is nothing but a windmill used for pumping water, either as a source of fresh water or wells. It is one in every of the earliest strategies of utilizing the energy of the wind to pump water.

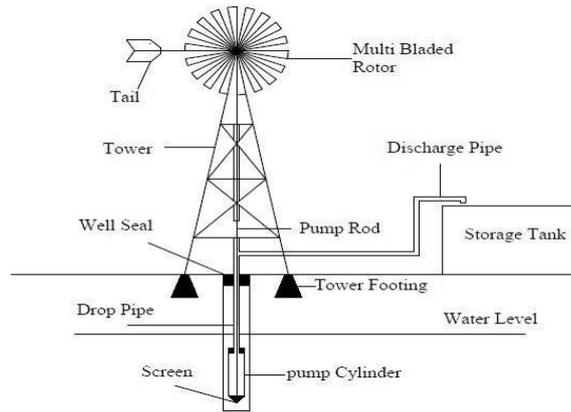
A windmill could be a mill that converts the energy of wind into motility energy by means that of vanes referred to sails or blades. Centuries are gone; windmills sometimes were accustomed to mill grain, pump water or each. Thus they often used grist mills, windpumps or both. The majority of modern windmill take the form of wind turbines used to generate electricity or wind pumps used to pump water either for land drainage or to extract groundwater.

Popular renewable energy sources making and expandable contribution to the energy supplies in view of encouraging renewable energy sources making and expandable sources beneficial, limitations and unpredictable supply of fossil fuel and rise in pressure in the environment due to generations through conventional energy. Among the renewable energy resources, the generations of electrical energy and mechanical energy by windmills have emerged as a feasible and cost-effective option.

Gears and bearings are subjected to very high heat losses due to friction and this will minimize the application of oil and grease. An alternative traditional cylinder pump is the airlift pump. The airlift pump is a type of deep good pump used to remove water from rivers, wells etc. It can also be used to pump a slurry of sand and water or other solutions. The pump has no moving parts rather than air compressor driven by the windmill. Compressed air is piped down to the well and attached to the discharged into the water column in the discharge pipe the mixture of air and water is made and is less heavy than the surrounding water in the well.

Wind

This is air in motion and it is a natural resource that is freely available in space and moves at varying speeds depending on the geographical location.



Wind Energy

Wind is the flow of gases on a large scale. On the surface of the Earth, wind consists of the bulk movement of air. In outer space, the solar wind is the movement of gases or charged particles from the sun through space, while planetary wind is the outgassing of light chemical elements from a planet's atmosphere into space. Winds are commonly classified by their spatial scale, their speed, and the types of forces that cause them, the regions in which they occur, and their effect. The strongest observed winds on a planet in our solar system occur on Neptune and Saturn. Winds have various aspect, one important aspect is its velocity; another is the density of the gas involved; another is the energy content or wind energy of wind.

Water Irrigation

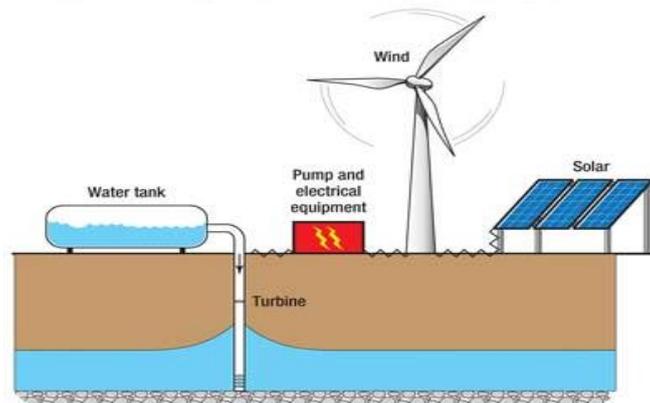
Irrigation is the method in which a controlled amount of water is supplied to plants at regular intervals for agriculture. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Additionally, irrigation also has a few other uses in crop production, which include protecting plants against frost, suppressing weed growth in grain fields and preventing soil consolidation. In contrast, agriculture that relies only on direct rainfall is referred to as rain-fed dry land farming.

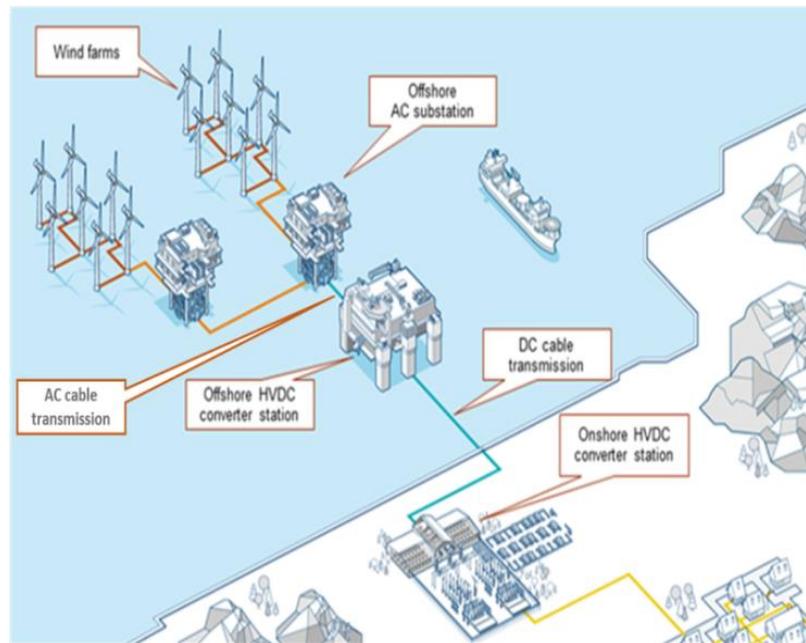
Background

The new way so fusing the energy of the wind eventually spread around the world. By the 11th century, people in the middle east used windmills extensively for food production. Returning merchants and crusaders carried this idea back to Europe. The Dutch refined the windmill and adapted it for draining lakes and marshes in the Rhine river delta. When settlers took this technology to the new world in the late 19th century, they began using windmills to pump water for farms and ranches and later to generate electricity for homes and industry.

Need of Windmill

In today's world, we need to move away from burning limited fossil fuel reserves to more sustainable and renewable sources of energy. Wind power is a well proven and cost-effective technology and expected to be the main way in which industry responds to the government's targets-so becoming an important source of electricity and water pumping in years to come.





LITERATURE REVIEW

Literature review is carried out to find out what are the earlier work has carried out with windmill.

[1] Water pumping system using windmill

Author Name: P Jagadeesh,GSampath, S.P Saran, M Selva, K Srithar Dept.Mech. Engg KSR Enggcollege,Tamil Nadu.

Journal Name: IJESC,volume 7,issue no.3,2017 Reseach article

Results: Total torque = 106.4572 Nm

Flow rate = $0.1736 \times 10^3 \text{ m}^3/\text{sec}$

[2] Development of wind-powered water pump Author Name: I.F. Odesda, L.G.Adinayi, dept of Engg. University of Ibadan Nigeria Journal Name: IJESC,volume 7,issue no.4,2017 Reseach article Results: As the wind speed increase the water discharge also increases.

[3] Wind powered water pumping systems for livestock watering. Journal Name: Joint publications of Alberta farm machinery Research centre Prairie Agricultural Machinery Institute, Canada

Results: Power delivered institute by windmill, $P = 0.01090^2 V^3 n$.

[4] Performance of a small wind-powered water pump. Journal Name: USDA-Agricultural research service, Bushland TX 79012 Results: The pumping performance measured was very good at demonstrating an ability to pump enough water at 50m pumping depth to water 120 cattle and at a 100m pumping depth to water 60 cattle.

[5] Design and development of windmill operated water pump.

Author Name: Ronak D. Gandhi,Pramodkothimare, debashreesharma, Bhushankumbhare,shubhamchoukade, MIT academy of engineering, pune

Journal Name: IJRERD Volume No. 1

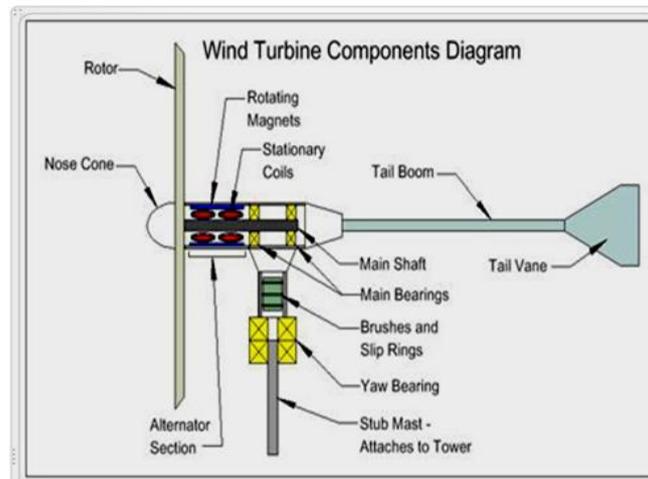


Fig :-Wind turbine components

PROBLEM IDENTIFICATION

As of now, India is now focusing on sustainable development with renewable resources like solar power, natural gas, wind etc. But somewhat it is behind that big economies. The government is pushing for solar energy as solar power is available in high amount in India and also natural gas and alternate fuels like biofuel, ethanol etc but we should also focus on its alternative. Though there are wind power mills at the coastal and hilly areas those are big ones and expensive ones. So we should now have a vision of manufacturing small wind turbines that can work at urban levels as well as irrigation purposes. This project is designed to fulfill these objectives and the blades are also designed in such a way that it can work at very low speed also. This vertical axis windmill is best suited where wind flow is not consistent just like in urban areas. Also, it is cheap to manufacture hence it is most beneficial for irrigation.

CONCLUSION

In the research of blade design and performance testing of a small wind turbine rotor, it comes to know that the turbine working best at 18 degrees. The 2 bladed rotors got C_p values got 0.1, 0.217 and 0.255 at wind speeds of 4, 5, 6 m/s respectively. Also, 3 bladed rotors achieved 0.052, 0.112 and 0.15 at same wind speeds. Peak power coefficient achieved by 2 bladed rotors at 6 m/s was 0.29. The savonius VAWT do not require large amounts of power. But is less powerful than HAWT because it uses drag to rotate itself and has a higher power to weight ratio.

ACKNOWLEDGEMENT

The authors would like to present their sincere gratitude towards the faculty of Department of Mechanical Engineering G.H Raisoni Academy of Engineering and Technology, Hingna, Nagpur.

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