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WINDMILL WATER PUMPING SYSTEM

Swapnil D. Dhenge[1], Mayur P. Durge[2], Ashish Wanve[3], Prof. Praful P. Ulhe[4]
[1,2,3]PG Scholar, [4]Guide
J D College Of Engineering & Management, Nagpur, India

Abstract: Wind energy can be generated using windmills that provide mechanical energy that is used directly on machinery e.g. water pump and grinder; or wind turbines that provide electrical energy. The main objective of our project was to design a windmill and therefore our scope will be limited to a windmill for water pumping water..Horizontal axis have the main rotor shaft running horizontally and if the rotor must be oriented in the direction of the wind, a wind vane is coupled with a servomotor. Vertical axis have the main rotor shaft running vertically. The rotor assembly can have two or more blades depending on the desired solidity.

I. INTRODUCTION

The wind power technology has evolved greatly and this has been motivated by the incredible benefits resulting from wind energy. Very efficient and technologically up-to- date designs have been developed and are used all over the country especially in arid and semi-arid areas to pump water for domestic and irrigation purposes. Wind energy was introduced in Northern Europe where Horizontal axis windmills were used where the sails connected to a horizontal shaft attached to a tower with gears and axles that were used to translate the horizontal motion into rotational motion. But we are using vertical type wind mill to generate more power in irrigation.

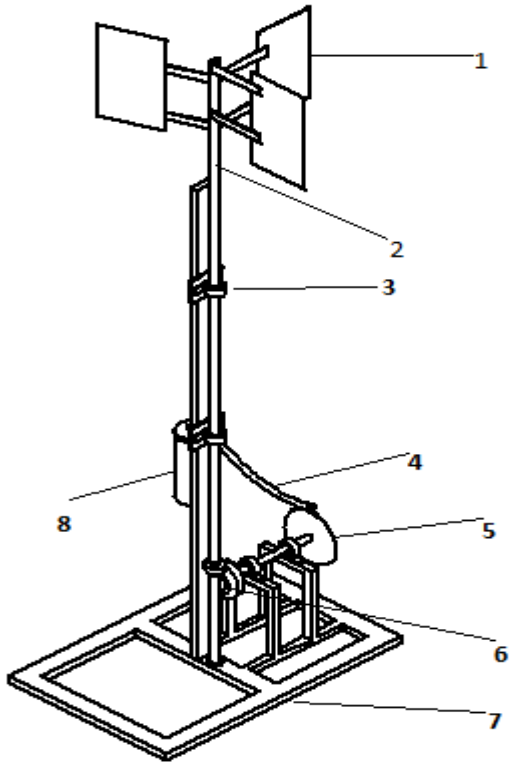
A. Selection of Site to Working

The viability of a windmill is greatly affected by its location. The site must have sufficient wind power to move the windmill and also be away from obstructions that might cause turbulence .The speed of wind for a given location is not constant and thus the climatic condition of the site should be examined for over on a year and recorded on a wind map which is then used to analyze the suitability of the sit .To avoid distractions, most windmills are located on hilly areas or the rigs are tall enough to ensure the rotor is far above the obstacles. The site of our windmill had been identified and there was no need for selection of another site. However we did an analysis on the site to determine its suitability and the findings were as follows. The location of the windmill is strategically away from tall buildings and tree

II. 3 WORKING OF WIND MILL WATER PUMPING SYSTEM

In this project blades are arranged on the vertical axis and are rotated by wind . When blades are rotated & generate power. This power is transmitted by tower for the different uses. A windmill converts the kinetic energy of the wind into mechanical power. This power drives an underground pump which lifts groundwater to the surface where it can be stored and used. A reciprocating piston-type pump is a simple construction. It consists of a cylinder pipe with a piston inside..When mechanical work is exerted on the connecting rod the piston moves up and down .The amount of water a wind-powered water pumping system can deliver depends on the speed and duration of the wind, the size and efficiency of the rotor, the efficiency of the pump being used, and how far the water has to be lift. In this project three blades are connected with rotor, when rotor rotated by wind, the power is transmitted from shaft to bevel gear. Main purpose of this bevel gear to transmitted power from shaft to reciprocating pump. Handle of reciprocating pump is attached with cam to take power from bevel gear. Reciprocating pump a piston pump, the piston is fitted with a non-return valve (the piston valve) and slides vertically up and down within a cylinder that is also fitted with a non-return valve (the foot valve). Raising and lowering the handle of the pump causes vertical movement of pump rods that are connected to the piston

III. DIAGRAM



1) Blade 2) Solid shaft 3) Pillow block bearing
4) handle of reciprocating pump 5) camp 6) bevel gear
7) base 8) reciprocating pump

IV. CALCULATION PART

1)The amount of power required from the wind.
Water power P= ϱ g Q H watts
ϱ=density of water kg/m3
g=gravity m/s2
Q- Flow rate (m3/s)
H - Total Pumping head in meters of water
Given the average wind speeds, the lowest average mean wind speed is selected (anemometer)3.5 m/s.
The average atmospheric temperatures are at an average low of 12C and a high of 28C.
2) Torque Extracted

$$T = \frac{1\pi R^3}{2\lambda} V^2 C_p \text{ Nm}$$

R = Rotor radius (m)
V = Wind speed (m/s)
λ = Tip speed ratio
C_p = Power coefficient

V. CONCLUSION

1) Gears and bearings are subject to very high heat losses due to friction and this will be greatly minimized by application of oil and grease and therefore greatly improving the efficiency.
2) All materials used are locally available and at a low cost making the model economically viable.
3) Improved torque characteristics on the current designs.
4) Improved efficiency based on the current designs.
5) The design should be a low-cost model.

VI. ADVANTAGES

1) It is the cheapest source of energy. This is because it does not require importation and it is readily available.
2) It is environmental friendly i.e. it is a major source of green energy as no greenhouse emissions are released to the atmosphere during its production.
3) Require less labour expenses as maintenance is very minimal and few personnel are required at the site.

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