Fabrication of Wind Turbine with and without Wind Energy

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Abstract - Wind mill is one of the potential resource of renewable energy. Wind turbines are rotated by wind energy. Where we have a concept to run or rotate the turbine even there is no wind energy by means of kinematic motion.We have made a small modification in wings of the wind mill. The wings are designed by making narrow slots in the mid region for the displacement of weight through slots by means of spring energy with the help of the guide way, thus this weight makes turbine to rotate.

Key word:displacement of weight,guide, kinematic motion, narrow slots, spring.

I. INTRODUCTION

If the efficiency of a wind turbine is increased, then more power can be generated thus decreasing the need for expensive power generators that cause pollution. This would also reduce the cost of power for the common people. The wind is literally there for the taking and doesn't cost any money. Power can be generated and stored by a wind turbine with little or no pollution

We know that for windmills to operate there must be wind, but how do they work? Actually there are two types of windmills -- the horizontal axis windmills and the vertical axis windmills. The horizontal axis windmills have a horizontal rotor much like the classic Dutch four-arm windmill. The horizontal axis windmills primarily rely on lift from the wind. As stated in Bernoulli's Principle, "a fluid will travel from an area of higher pressure to an area of lower pressure." It also states, "as the velocity of a fluid increases, its density decreases." Based upon this principle, horizontal axis windmill blades have been designed much like the wings of an airplane, with a curved top. This design increases the velocity of the air on top of the blade thus decreasing its density and causing the air on the bottom of the blade to go towards the top ... creating lift. The blades are angled on the axis as to utilize the lift in the rotation. The blades on modern wind turbines are designed for maximum lift and minimal drag.

There are many types of windmills, such as: the tower mill, sock mill, sail windmill, water pump, spring mill, multi-blade, cyclo-turbine, and the classic four-arm windmill. All of the above windmills have their advantages. Some windmills, like the sail windmill, are relatively slow moving, have a low tip speed ratio and are not very energy efficient compared to the cyclo-turbine, but are much cheaper and money is the great equalizer.

II. EXPERIMENTAL PROCEDURE

2.1. COMPONENTS USED

The following tabulation contains the components required for designing

Table: 2.1.1. Tabulation for components required

S.NO	COMPONENTS	MATERIAL	QTY
1	Shaft	Mild steel	2
2	Bearing	Stainless Steel	4
3	Gear	Plastic	4
4	Wing setup	Mild Steel Plate	1
5	Spring	Stainless Steel	3
6	Weight Element	Mild Steel	3
7	Dynamo	-	1
8	‘U’ Clamp	Mild steel	8
9	Bolt & nuts	Mild Steel	20
10	Stand	Mild Steel	1

2.2. MAIN COMPONENTS

2.2.1. Bearing

These are machine components designed to provide support for rotating machine elements by taking pure radial loads, pure thrust loads or a combination of the two.

2.2.2. Gear

These are wheel-like shaped components that have equally spaced teeth around their outer periphery and it engages another toothed mechanism in order to change the speed or direction of transmitted motion .Gears are mounted on rotatable shafts with the teeth on one gear meshing with the teeth of the other gear and thus transmitting rotary motion in the process. This also causes transfer of torque from one part of the machine to the other.

2.2.3. Shaft

A shaft is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to a machine which absorbs power. The various members such as pulleys and gears are mounted on it.

2.2.4. Dynamo

A machine for converting mechanical energy into electrical energy, typically by means of rotating coils of copper wire in a magnetic field.

2.3. Materials Used

Mild steel

Stainless steel

Plastic

2.4. SETUP DESIGN

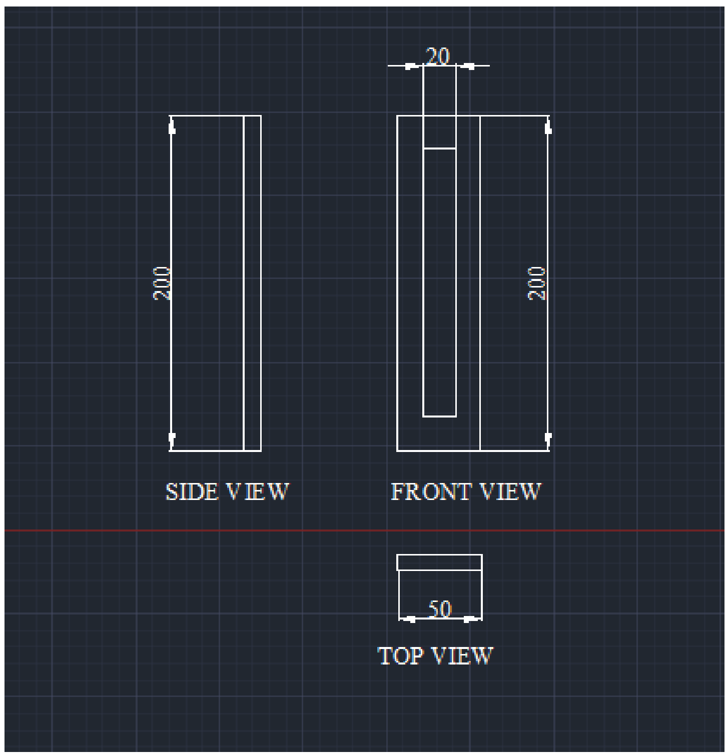

Fig: 2.4.1. Layout of wing

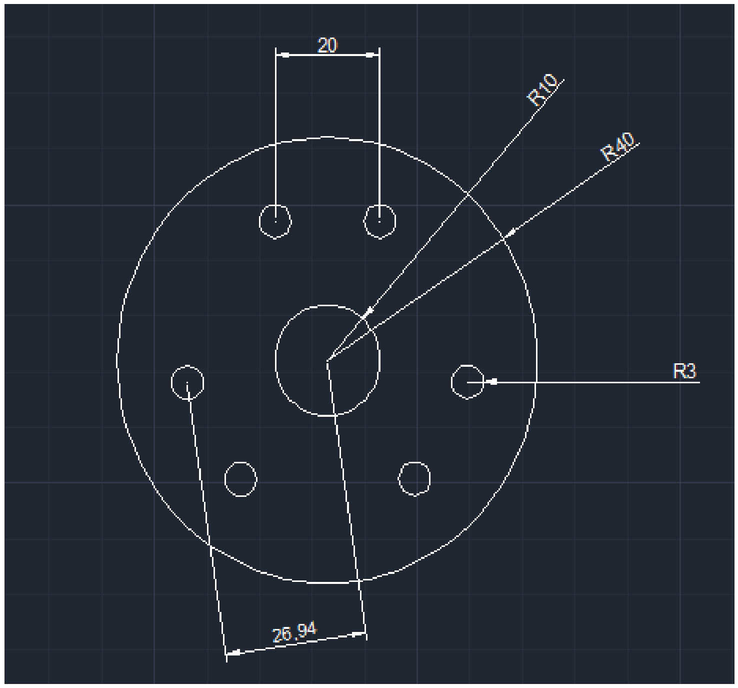

Fig: 2.4.2. Layout of hub

2.5. WORKING

The work is concerned with generation of electricity from wind turbine. The load acts upon the wing - setup is there by transmitted through the shaft to gear and pinion arrangements.When the load acts on one side of the wing the loaded wing is gradually pulled down and by simultaneous action of applying load on the wings. The opposite side of the wing is gradually decreased by this action the combo of three wings are by this action the power is transmitted by the gear converter. The shaft that is connected to the main shaft is rotated and the working is naturally obtained by this performance thus the working is concerned with the load applied on the wing through action of springs makes the wings to move towards down due to gravitation force. Here the newton's law of gravity is performed and applied therefore this action by the gravity is also performed by the opposed action of gravitational of the wings.The gear arrangement is made up of four gears. Two of larger size and the other two of smaller size. Both the gears are connected are meshed directly which serves in transmitting power from the larger gear to the smaller pinion. As the power is transmitted from the larger gear to the smaller pinion, the speed that is available at the larger gear is relatively multiplied at the rotation of the smaller pinion.

The axis of the smaller gear is coupled to a gear arrangement. Here we have two gears with different diameters. The gear wheel with the larger dimension is meshed to the axis of the smaller pinion. The smaller gear is coupled to the larger gear. So as the larger gear rotates at the multiplied speed of the smaller sprocket, the smaller gear following the larger gear still multiplies the speed to more intensity.This speed which is sufficient to rotate the rotor of a generator is fed into to the rotor of a generator. The rotor which rotates within a static magnetic stator cuts the magnetic flux surrounding it, thus producing the electric motive force (emf). This generated emf is then sent to an inverter, where the generated emf is regulated. This regulated emf is now sent to the storage battery.

III. RESULT AND DISCUSSION

Thus the turbine was rotated by kinematic motion without wind energy.We had a problem offriction between the guide and balancing weight.Designing of guide seems to be difficult. Sliding of weight through the wings slot is improper.The rotational speeds of both the rotor shaft and generator shaft were also obtained.

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.

We know that, the reaction between the mating teeth occur along the pressure line, and the power is transmitted by means of a force exerted by the tooth of the driving gear on the meshing tooth of the driven gear. (i.e. driving pinion exerting force PN on the tooth of driven gear). According to fundamental law of gear this resultant force PN always acts along the pressure line.

This resultant force PN, can be resolved into two components – tangential component Pt and radial components Pr at the pitch point.

The tangential component Pt is a useful component (load) because it determines the magnitude of the torque and consequently the power, which is transmitted

Fig: 3.1. Setup of wind turbine

IV. CONCLUSION

From our experiment we can concluded that the modified wing setupeffectively operates the wind turbine without wind energy by springs and slotted weights by means of kinematic motion. Today, wind power is economically competitive compared to traditional energy because the cost of wind turbines is getting cheaper because of technology advancement and government incentives.

It also creates jobs and generates extra personal and tax income. Wind energy is also a renewable and pollution-free energy which can help us reduce the emissions of greenhouse gases. I believe that wind energy can become an important asset to solve climate change and global warming issues in the future.To improve the material properties and design capability so that the structure will withstand higher stresses, or the same level of stress for a much longer period of time.

The resin transfer molding process has demonstrated the capability of producing quality fan blades up to 40 feet in diameter. Prototype studies to make GRP blades by this process should be undertaken. The study must include trade-off studies of manufacturing cost and quality versus losses in aerodynamic efficiency to enhance reducibility.

REFERENCES

[1] Ishihara T., Phuc, P.V.,et al., 2007a. Numerical study on the dynamic response of a floating offshore wind turbine system due to resonance and nonlinear wave. Proceedings of 2nd EOW, Berlin, Germany, December 4–6, 2007.

[2] Ishihara. T., Phuc, P.V.,et al., 2008. A numerical model for prediction of the dynamic responses of floater with elastic deformations. Proceedings of 30th Symposium on Wind Energy Utilization, Japan, Japan Wind Energy Association, 221–224. (in Japanese).

[3] Ishihara. T., et al., 2007b. A study on the dynamic response of a semi-submersible floating offshore wind turbine system Part 1: a water tank test. Proceedings of the 12th International Conference on Wind Engineering, Cairns, Australia.

[4] Ishihara. T., Waris, M.B.,et al., 2009. A study on influence of heave plate on dynamic response of floating offshore wind turbine system. Proceedings of 3rd European Offshore Wind Conference and Exhibition, Stockholm, Sweden, 14–16 September 2009.

[5] Jonkman. J.M. and Buhl, M.L, 2007. Loads analysis of a floating offshore wind turbine using fully coupled simulation. Proceedings of Wind Power 2007 Conference and Exhibition, Los Angeles, California, 3–6 June 2007.

[6] Karimirad. M and Moan.T 2010. Extreme structural response of a spar type wind turbine. Proceedings of the 29th International Conference on Ocean, Offshore and Arctic Engineering, 6–11 June 2010, OMAE2010-20044.

[7] Kourogi. Y.,Hiramsatsu. T., et al., 2009. Sailing performance of a very large mobile offshore structure for wind power plant. Proceedings of the 28th International Conference on Ocean, Offshore and Arctic Engineering, Honolulu, Hawaii, USA, 31 May–5 June, OMAE2009-79196.

[8] Kourogi. Y., Takagi. K., et al., 2008. Experimental study on maneuverability coefficients for the navigation simulation of VLMOS. Proceedings of OCEANS008 MTS/IEEE Kobe Techno Ocean008, Kobe International Exhibition Hall, Kobe, Japan, 8–11 April, 2008.

[9] Matsukuma. H. and Utsunomiya. T., 2008. Motion analysis of a floating offshore wind turbine considering rotor rotation. The IES Journal Part A: Civil and Structural Engineering, 1 (4), 268–279.

[10] Moriya. Y., et al., 2007. Motion characteristics of cylindrical body for offshore wind power generation. Journal of Civil Engineering in the Ocean, JSCE, 23, 985–990.

[11] Musial. W., Butterfield. S., et al., 2004. Feasibility of floating platform systems for wind turbines. NREL/ CP-500-34874. 23rd ASME Wind Energy Symposium Proceedings, Reno, Nevada, 5–8 January 2004.

[12] Nielson. F.G., Hanson. T.D., et al., 2006. Integrated dynamic analysis of floating offshore wind turbines. Proceedings of 25th International Conference on Offshore Mechanics and Arctic Engineering Hamburg, Germany, 4–9 June 2006, OMAE2006-92291.