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DESIGN OF EXPERIMENTAL SETUP OF 1KW WIND TURBINE BLADE TESTING

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ABSTRACT

The objective of our project is 'Design of experimental setup of 1KW wind turbine blade testing'. Due to increase in Requirement of Non-conventional energy we developed turbine having maximum diameter because as size increase power generation is also increase. But if size of blade is more then blade have maximum vibration and due to this vibration power loss also takes place.But if we reduce vibration then we get maximum power from same wind turbine. so for the study of vibration reduction research work this experimental setup is required

Keywords –Wind Turbine , Blade , Wind , Electical energy ,Grid

I. INTRODUCTION

Due to the increasing environmental and economic cost of fossil fuels, alternative sources of energy are needed. One such source is energy wind energy. A wind turbine is a device that converts the wind's kinetic energy into Mechanical energy. Wind turbines are manufactured in a wide range of vertical and horizontal axis types, in this we are going to use horizontal axes type wind turbine. In our experimental setup we are using AC motor instead of generator to rotate blades and we can measure the vibration in our experimental setup. The smallest turbines are used for applications such as battery charging for auxiliary power for boats or caravans or to power traffic warning signs. Slightly larger turbines can be used for making contributions to a domestic power supply while selling unused power back to the utility supplier via the electrical grid. Arrays of large turbines, known as wind farms, are becoming an increasingly important source of intermittent renewable energy and are used by many countries as part of a strategy to reduce their reliance on fossil fuels.

II. WORKING PRINCIPLE

Wind turbines operate on a simple principle. The energy in the wind turns two or three propeller-like blades around a rotor. The rotor is connected to the main shaft, which spins a generator to create electricity

So how do wind turbines make electricity? Simply stated, a wind turbine works the opposite of a fan. Instead of using electricity to make wind, like a fan, wind turbines use wind to make electricity. The wind turns the blades, which spin a shaft, which connects to a generator and makes electricity.

The terms wind energy or wind power describe the process by which the wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into electricity.

II. DESIGN AND CONSTUCTION

COMPONENTS DETAILS :-

Blade:

- A turbine blade is the individual component which makes up the turbine section of a gas turbine or steam turbine.
- The blades are responsible for extracting energy from the high temperature, high pressure gas produced by the combustor.
- The turbine blades are often the limiting component of gas turbines.
- Specification:
- Quantity=3 pcs
- Length=1525MM
- Material=GFRP (glass-fiber reinforced resin)

Frame:

- L Channel- MS Angles are L-shaped structural steel represented by dimension of sides & thickness.
- 25x25x3 means, both the sides of angles are 25 mm & thickness is of 3 mm.

Shaft:

- The shafts are always subjected to fatigue load hence they must be calculated for fatigue strength under combined bending and torsion loading.
- However, the initial estimate of diameter is obtained from the torque that is transmitted by the shaft.
- power transmitted by the shaft (W) = 12 watt
- *N* = rpm of the motor shaft = 1400 rpm
- Shaft diameter = 15 mm

Bearing:

- Bearing are required to mount the shaft to the frame stand.

- The use of bearings is to provide the end supports to the shafts as well as to provide a relative movable support. So that the pulley can rotate about its axis.

  Specification:

  Radial Ball Bearing: 6002

  Dimensions Of Bearing:

  Inside Diameter= 15mm,

  Outside Diameter =35mm,

Gear box:

A gearbox is a machine in a power transmission system, which provides controlled application of the power. Often the term transmission refers simply to the gearbox that uses gears and gear trains to provide speed and torque conversions from a rotating power source to another device.

Specification:

Structure= 1 planetary gear, 2 parallel gears

Gear ratio= nearly 1:100 (50Hz)

nearly 1:120 (60Hz)

Structural support

The structural support component, which is approximately 15% of the wind turbine cost.

3D MODEL

III. ADVANTAGES

- Generates more power than traditional wind mills.
- Easy installation.
- Saves space
- Wind turbine is a domestic source of energy.
- The wind is free and with modern technology it can be captured efficiently.
- It doesn't require fuel.
- It doesn't create greenhouse gasses.

IV. APPLICATION

- Agricultural use.
- For commercial electricity generation.
- Multi-blade windmill used for water.

V. CONCLUSION

Hence we design and develop of real time wind mill.

The wind turbine generates more power than the conventional wind mills.

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