Wind Turbines

Core Rotating Wind Turbines

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Key words: core rotating wind turbines, dual rotor wind turbine, wind turbines, crwt, advanced wind turbines.

Abstract

In these papers I present about core rotating wind turbines. World runs on power. Automation leading to increase of power need. Substantial power is coming from non renewable recourses. But they will disappear. We have to emphasize the use of renewable energy recourses. They are many sources for renewable energy via. Solar, geothermal, tidal, wind& etc. wind turbines are used to gain energy from velocity of air. They convert it to mechanical energy; there by electrical energy .Core rotating wind turbines are new method to improve the output of wind turbine with little arrangement for core of turbine. The arrangement is another set of blades to core of dynamo. In this method both core and shaft of wind turbine rotate in opposite direction. The blades are designed in such a way that they get the lift in opposite direction. It requires a specially designed dynamo for this purpose. Thereby improving speed of the turbine leading to more power. They can be adopted at low wind speeds. They can be arranged at low heights. With this method power of wind turbine almost doubles. From this papers and power calculations I'm concluding that core rotating wind turbines give more power .General wind turbine can also be made core rotating wind turbine with some modifications.

Introduction

World runs on power. Nonrenewable resources will disappear. We have to look for renewable resources. There are many renewable resources some of them are ,solar ,geothermal ,tidal ,wind ,etc. wind turbines are the devises that are employed to gain kinetic energy of wind…

Turbine is a mechanical device which converts one form of energy in to other i.e., general kinetic energy of wind to mechanical energy there by useful electric energy. The energy available for conversion mainly depends on wind speed and the swept area of turbine. When planning wind form it is important to know expected power and energy output of each wind turbine to be able to calculate economic viability.

There are many part of wind turbine namely blades, shaft, nacelle, hub, anemometer and dynamo. The turbine works mainly on the dynamo principle which is based on faraday's law of electromagnetic induction that when a conductor rotates in the magnetic field the current is produced. Here the conductor(i.e. shaft) will rotate with the help of blades provided to the turbine. This is all a wind turbine has.

Core rotating wind turbines

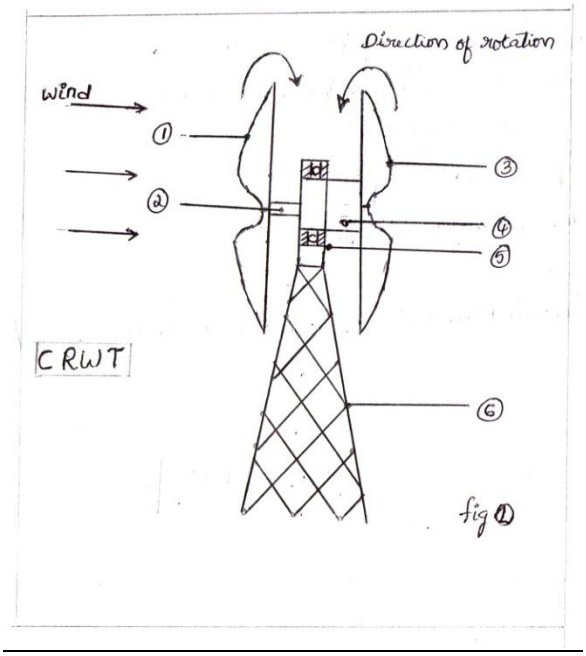
In core rotating wind turbine both the shaft (i.e., conductor) and the core of the wind turbine rotates. The rotation of the core is done by providing a extra setup to the core of turbine. Both will rotate in quite opposite direction. The extra setup is additional set of blades which are provided for the core of the turbine dynamo. Bearing attachment is provided for core for support. When the wind blows shaft blades and core blades rotate.

How the blades rotate in opposite direction when the wind blows in one direction?

Direction of rotation depends on design of blades. Both blades are designed in such a way that they rotate in opposite direction

Mechanical speed of the shaft increases with respect to core or speed of core increases with respect to shaft. According to the principle of dynamo "when a current carrying conductor rotates in magnetic field emf will be induced". The quantity of induced emf depends on speed with which the conductor cuts the magnetic field. So increasing the speed of shaft in core rotating wind turbines leads to the increase of power of turbine.

Imaginary figure of core rotating wind turbine



Various parts are

1. Blades for shaft of dynamo
2. Shaft
3. Blades for core of dynamo
4. Dynamo core
5. Bearings for support
6. Tower

In the figure you can see direction of both the blades is opposite to each other .one rotate in clockwise and another rotate in anticlockwise.

Blades design

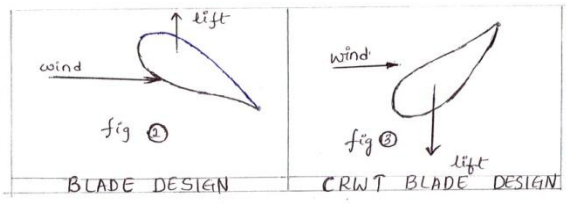


Figure (2) is design of blade of general wind turbine.wind blowing in positive x - direction and lift we are getting in positive y- direction.

For design blade for core of crwt wind turbine with the same direction of wind we have to get the lift in negative y- direction.

Figure (3) shows the design of blades for core. For that design we are getting lift in negative y- direction.

In the design it is clearly mentioned the difference of blade design concavity upward and downward .

Advantages

Like wind turbines, core rotating wind turbines have all the advantages.

- Wind is unlimited source of energy.
- They can be installed at lower altitude.
- They can give power at low speed of wind also.
- They cangive power output continuously (24*7).
- Swept area of wind turbine can be reduced.

Disadvantages

There are some disadvantages with core rotating wind turbines.

- Design of blade is somewhat complicated
- Initial cost is high
- Require more area for installation
- Ecological disadvantage double blow for birds

Related work:

Calculation:

The following table shows the definition of various variables used in this model:

K= kinetic Energy (j)
v=wind velocity

D=density
C_p=power coefficient

M= mass P=power

A= swept area
r=radius

X=distance dM/dt=mass flow rate
dK/dt=energy flow rate

T=time

Under constant acceleration, the kinetic energy of an object having mass M and velocity v is equal to the work done W in displacing that object from rest to a distance s under a force F, i.e..,

K=W=F.s

According to newton's law, we have:F=ma

Hence,K=mas…….(1)

Using the third equation of motion:

$v^2=u^2+2as$

We get:$a= (v^2-u^2)/2s$

Since the initial velocity of the object is zero, i.e., u=0 we get:

$a=v^2/2s$

Substituting it in eq (1), we get that the kinetic energy of a mass in motions is:

$K=1/2mv^2$…… (2)

The power in the wind is given by the rate of change of energy:

$P=dK/dt=1/2mv^2dm/dt$….. (3)

As mass flow rate is given by:

dx/dt=DAB

Hence, from equation (3), the power can be defined as:

$P=1/2DAV^3$…… (4)

According to Bent'z theory no wind turbine can convert 59.3% kinetic energy of wind in to mechanical energy turning a rotor. So the maximum theoretical power efficiency of any design of wind turbine is 0.59 this is called "power coefficient"

$C_{pmax}=0.59$

C_p value is unique to each wind turbine .so power

$P=1/2\ C_PDAV^3$

Own work

For core rotating wind turbine power $p"=1/2DA'V^3$

A'=swept area of shaft propeller blade +swept area of blade on propeller on core

(if we take them as equal A'=A+A=2A)

$P''=1/2(2A)DV^3$

$P''= 2(1/2DAV^3) =2P$ Power doubles

At dynamo

$P''=(2*3.14*NT)/60$

N'=speed of shaft w.r.t. core

N'=speed of shaft+ speed of core

If we take them equal N'=N+N=2N

Similarly as above P"=2P

RESULT

BY USING CORE ROTATING WIND TURBINES UNDER EQUAL SPEED OF SHAFT & CORE THEY GIVES DOUBLE POWER.CORE ROTATING WIND TURBINES GIVE MORE POWER.

But it is difficult to achieve equal speed in general practice because core and shaft diameter differ by large extent. Power increases but Efficiency not increases.

CONCLUSION

From our papers we are concluding that core rotating wind turbines gain more power compared to traditional turbines .By providing some additional set up we can make traditional turbine a core rotating wind turbine.

Acknowledgment

Author would like to thank

Prof. " Sri R. Sam sukumar" (dept. of mechanical engg ,swarnandra college)

And everyone who helps in making this paper.

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