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Self Aligning Horizontally Ducted Wind Powered Air Conditioner

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ABSTRACT: Refrigeration was once need but now it has become necessity. In this process we use a refrigerant and with the help of that it cools the ambience. This technology has become quite common now a days and its application can be seen everywhere. In our project we have worked on lowering the overall cost and optimizing the whole system to make it pro-environment. Our system will be eco friendly. There will be a battery which will be charged using the wind turbine i.e. conversion of wind energy to electrical energy. The power from battery will be converted into AC using inverter which will run the AC Compressor. It all focuses on providing cool and humid free ambience using wind energy at a lower rate.

I. INTRODUCTION

As we know that the whole world is fed of a common thing i.e. pollution. In this modern world it is very difficult to control the pollution. So being an engineer it is our duty to make the world pollution free by using renewable source of energies. So keeping all these things in mind we have selected our project that is totally based on wind energy. Our project is an Air Conditioner working with the help of wind energy by converting it into the electrical energy with the help of wind turbine. The wind turbine will produce the energy to run the air conditioner. As we know that we are living in plain areas so the speed of the air is not sufficient enough to operate the turbine. So for that purpose we use duct in frontal part of the wind turbine. By the help of duct the speed of the wind can be increased about twice to thrice that ultimately helps in running the wind turbine.

Operating principle

The mechanism on which the air condition depends is refrigerant liquid. In this mechanism the heat is transported from a cooler region to a hotter area. The main function of the refrigerant liquid is to evaporates itself as it extracts heat from the air around it and in low pressure region it again gets converted to liquid and after entering the normal pressure region it again gets converted to gas. When it evaporates it absorbs the heat from air around it that ultimately cools the surrounding and this is how refrigeration effect is produced and we get the cooled air. Our wind powered air conditioners also works on the same principle , the only difference is of the power source. In wind powered air conditioners the electrical energy is produced by the help of wind using wind turbines.

The parts that includes to our wind powered air conditioner (constructional details)

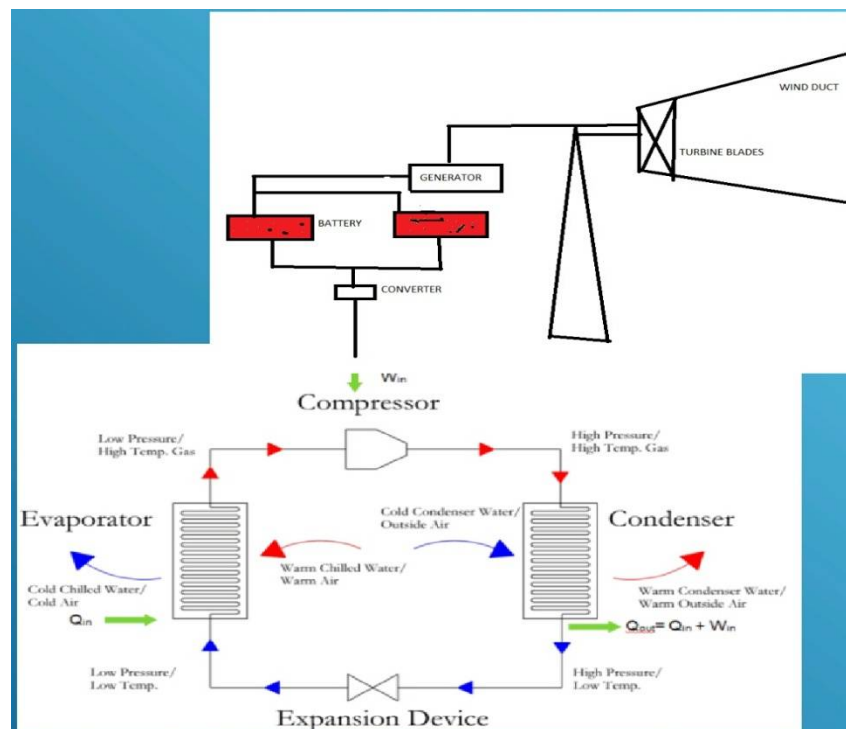
AC consists of four main sections those are –

1. REFRIGERANT CIRCUIT COMPONENTS: circulation of refrigerant and radiation of heat(compressor, evaporator, condenser, capillary tube)
2. VENTILATION: distribution of air(indoor),heat dissipation(outdoor)(impeller, fan, motor etc).
3. ELECTRICAL PARTS: climate control(remote control, electronic circuit, boards, electrical system)
4. OTHERS: unit casing, air filter etc.

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Equations used

To determine the power produced by the wind turbine to generate the electricity is given by:
 $POWER(P) = 0.5 * D * A * C_p * V^3 * N_g * N_b$

Where, D= density of the air striking the blades of the turbine.

A= area swept by the rotor

V= wind velocity

N_g = generator efficiency

N_b =gear box efficiency

Let us take the total loss factor =0.1

II. OUR PROPOSED WORK

The project that we have come up for is to run an Air Conditioner by the help of wind power. In this project we will connect a DC generator with wind turbine and this generator will supply DC current to the system. Since we are using AC compressor that's why this DC current will have to be converted to AC by the help of inverter. This converted AC will be used by the AC compressor to produce the cooling in air conditioner.

There are certain calculations that has to be performed for the design of the turbine blades, the amount of power generated to operate compressor, losses etc. let us take

1. Dia. Of blades=1.5m
2. Now the area swept by the blade will be $=3.14 * 1.5 * 1.5m^2$ approximately $1.767m^2$
3. The velocity in our area where the setup is established is nearly 3 to 4 m/s.
4. Our main aim is to increase the velocity is done by the help of DUCT. Due to which the velocity is nearly thriced.
5. So the power produced by the wind turbine is given by $:0.1 * A * V^3 = \text{approx. } 125W$
6. We have taken the compressor of power 1500W.

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7. From this we can say that the power given by the wind turbine is 1/12 times the power required for compressor to operate.

Wind turbine and its components

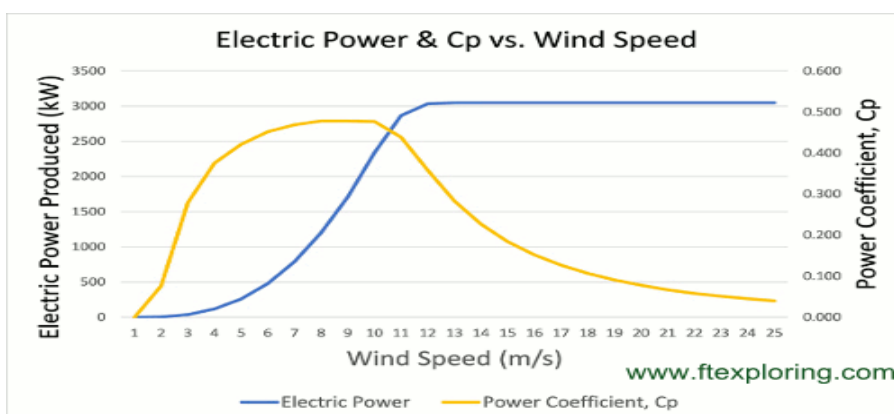
1. Air blows because of the fact that the atmosphere is unevenly heated by the rays of the sun due to which the pressure at some places is higher and at some places it is lower. Due to this pressure change the air blows.
2. This wind strikes the blades of the turbine that rotates the rotor that ultimately connected to the generator and the electricity is produced.
3. The speed of the wind will decide the amount of power generated by the wind turbine.
4. the components that are there in the wind turbine are:
 1. Rotor
 2. Generator
 3. Blades

Why to use this system

1. The most important factor is that it is eco-friendly in nature.
2. Once it is setup it will lasts long.
3. The cost of maintenance is quite low.
4. It is very much reliable and durable in nature.
5. It helps in providing job opportunities.

Why it is less preferred

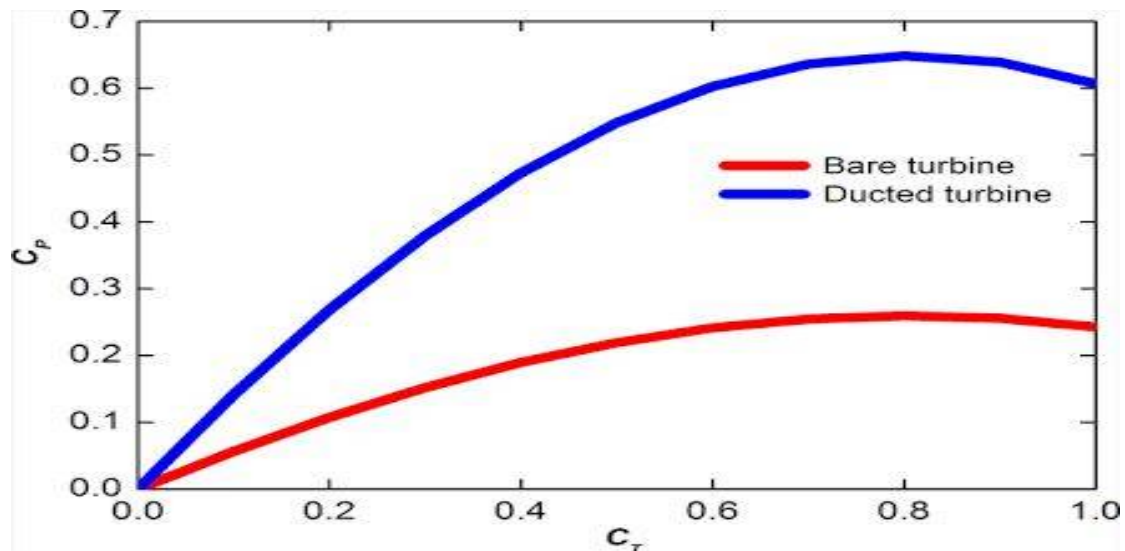
1. In storing the energy produced by the plant is still a problem.
2. The setup cost at the initial stage is high.
3. It can only be set up at some specific areas.
4. Threat to wildlife.



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III. CONCLUSION

Air is the gift of nature to the flora of Earth. Air is essential for survival of every living being. Apart from this air can be used for various other purposes. Wind contains limitless power energy, the only thing as an Engineer we can do is to utilize the wind energy efficiently and effectively. In this research we have emphasized on effective utilization of wind energy. By using duct we have increased the speed of wind at the inlet of turbine blades i.e. at the outlet of duct. The special feature of the setup is self-aligning property of the duct. The extended portion of the duct has more surface area than the duct's surface area. That's why the total moment acting on extended surface is always greater than the moment of duct. So the duct aligns automatically towards the direction of wind. Hence the speed of wind increases after passing through duct and we can get more rotation per minute of the turbine blades, resulting in more power generation. The power generated is stored in battery and after which the DC is converted to AC by using an inverter and then the Air Conditioner operates. Though the energy generated and stored in batteries is not sufficient to run an AC for a long time but at least it works for 2 hours according to our setup. Global warming is a prime environmental concern now a days and one of the most major causes of it is air pollution. By generating power through wind using wind turbine we are at least reducing some amount of pollution and paying some debt of our Mother Nature and Earth. According to our calculations we are able to run the AC up to two hours by charging the batteries for twenty-four hours. Thus concluding the whole research in couple of lines we can say that it is the best, effective, efficient and an eco-friendly way for running the air conditioners.

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