INDUSTRIAL EXHAUST FANS AS SOURCE OF POWER

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ABSTRACT

The energy interest of the world has gotten an uncontrolled in the previous years and is expanding significantly. Two vertical axis wind turbines with an enclosure are mounted above a cooling tower to recover part of the energy from the exhaust air. An idea was on harnessing unnatural wind resources for the electricity are presented. This has incited a broad examination into the zone of non-customary fuel sources like hydro, wind, nuclear power, and so on Out of these, the breeze energy is being examined in this paper. Wind energy has a great deal of potential and benefits however its usage is limited because of its inconsistency, topographical conditions and its accessibility. Our essential objective is to recommend a thought that can be conquered these issues and use the breeze energy to its greatest degree. This paper manages the breeze energy that can be separated from the squandered breeze energy from modern fumes fans The integration of the enclosure has shown an improvement on the turbine's rotational speed which is 30.4% higher. The electricity generated from this system can be fed into the electricity grid. For 3000 units of cooling tower (2 m outlet diameter powered by a 7.5 kW fan motor and operated for 16 hours/day), 13% of the energy to power the fan motor is expected to be recovered from this system which equals 17.5 GWh /year.

Keywords: *Wind power, exhaust fan, wind turbine, storage.*

1. INTRODUCTION

Nowadays, a global energy consumption has in both developed and developing countries has expanded rapidly due to the population extension and it is expected to twin or more by the year 2042.The utilization of sustainable power innovation to satisfy the energy needs has been persistently expanding for as far back as couple of years. For this reason we have the chipped away at a different thought. We considered fumes fans utilizing in enterprises as a high speed and consistent breeze source Now a days, worldwide energy utilization in both created and non-industrial nations has expanded quickly because of populace development and it is required to twofold or more constantly 2040.1 Renewable energy (RE) resources play an important role as alternative energy sources to limit the dependency on fossil fuels for electricity generation. Recently, numerous researchers have put RE in the limelight and intensive researches were done to improve the efficiency of RE resources for energy generation This patented system comprises of two vertical axis the wind turbines (VAWTs) installed above an exhaust outlet in cross wind orientation to harness the discharged wind energy. The discharged wind energy from the exhaust air system is reliable for electricity generation because it is strong and consistent; allowing VAWTs to operate with minimum fluctuation. This theory is successfully utilized by the diffuser increase wind turbine (DAWT). DAWT is the hot topic to better the output power of a wind turbine. The softening of ice causes the ascent of ocean level and lesser land can be utilized for an expanding total populace, alongside the adjustments in environment. It helps to accelerate the wind speed by creating a separation region behind the wind turbine where low-pressure regions act as sucking the effect to draws a more wind compared to a conventional wind turbine.16 One of the most recent experimental investigations on the diffuser design of a horizontal axis wind turbine showed that the performance has of a diffuser-shrouded the wind turbine is better in terms of a power coefficient.

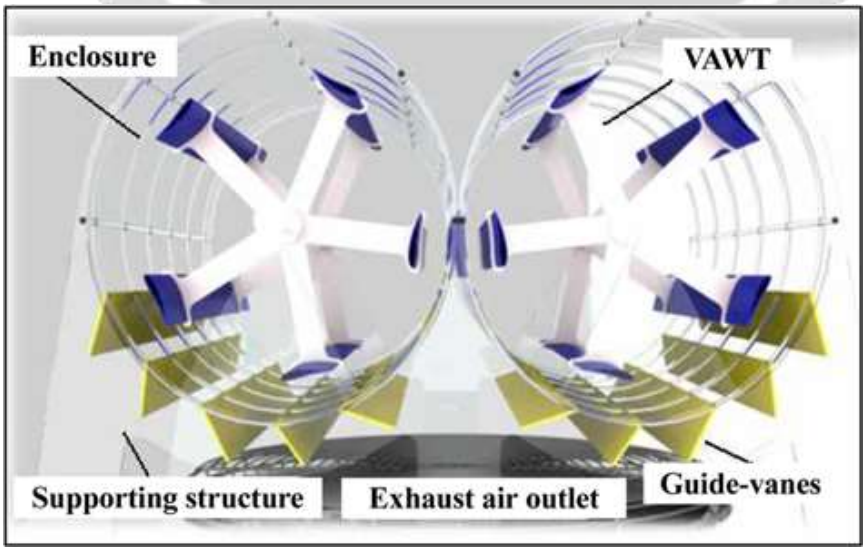
2. EXHAUST FAN

Fig. 1 Industrial Exhaust Fan

Exhaust Fan are heat removal devices used to transfer waste heat to the atmosphere i.e. Exhaust an air system has been introduced in this paper for the electricity generation. The design is known as exhaust air an energy the recovery system and it takes the advantages of the discharged the airflow characteristic from exhaust air systems which have a consistent and predictable wind speed. There are many forced ventilated situations are available globally including ventilated the exhaust from the air a conditioning system. These situations allow a large deployment of the exhaust air energy recovery system.

The designed a system is adjacent by an enclosure which consists of diffuser plates and guide vanes for a better wind turbine show. The design of the system also takes into the reflection the show of the exhaust air system, where no negative impact could be improved. This system is supported by supporting a structure and it can be fix above the exhaust air system either horizontally or vertically depending on the direction of release air relative to the turbines.. For an instance, when the wind blows up in a vertical direction from beneath, the whole system is installed in a horizontal direction and the supporting a structure holds the transmission shaft on both ends of the VAWT (a generator at one aside while bearing at the other side).

In contrary, the system is mounted in a vertical direction with the generator placed on the floor when the discharged air is coming sideways. General arrangement and working principle of the designed exhaust air energy recovery turbine system shows the general arrangement of the exhaust air energy recovery system.



This exhaust air energy recovery system has great marketing value since there are many cooling towers as well

as other exhaust air systems around the world. Besides, it is an on-site green energy invention as it does not contribute to any kind of pollution but instead, it re-uses wasted air from the exhaust air system to conserve a part of the energy consumption. The combination of this green technology of a building should be able to obtain the green building index rating. The design of this system also takes the safety issues into a consideration. A enclosure acts as a safety cover to protects the entire system from public or the maintenance worker hazard in the event of a blade failure. This ac energy can be provided to the load and grid.

The wind power is the conversion of wind energy into a useful form of energy, such as using wind turbines to make the electrical power, windmills for the mechanical power, wind pumps for the water pumping or drainage, or sails to propel ships.

This mechanism begets several advantages:

- It is renewable source of energy.
- It emits no greenhouse gases and hence nonpolluting.
- It uses very little land
- Fuel transportation are not required in wind energy conversion system.

3. BLOCK KDIAGRAM:

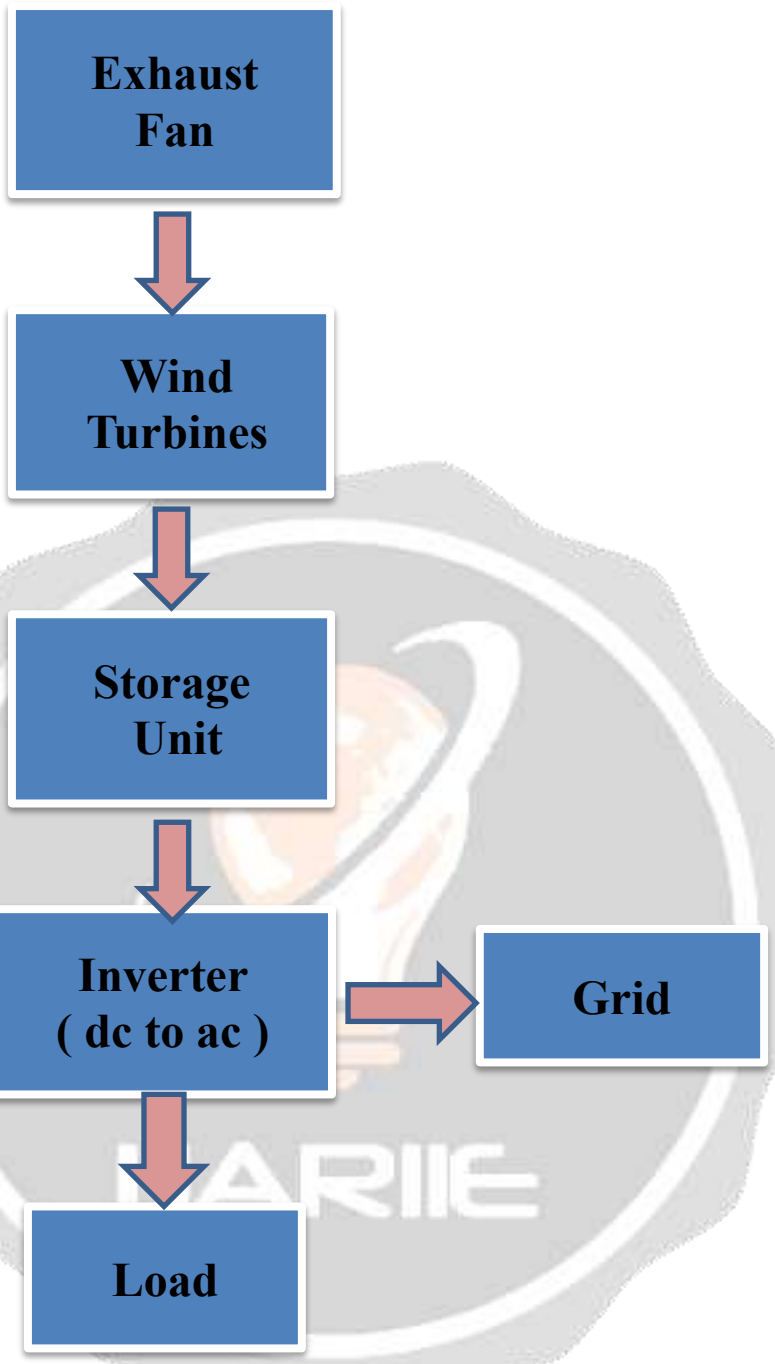


Fig 1. Flow chart of the process of using exhaust fan as a source of power Wind energy.

4. WIND ENERGY

Renewable energy (RE) resources play a major role as different energy sources to limit the holding on fossil fuels for an electricity generation. Recently, numerous researchers have put RE in the limelight and intensive researches were done to improve the efficiency of RE capital for the energy generation. All the works have emphasized the sustainability at the early design stages so that they can perform with minimum usage of energy without producing hazardous wastes. Among the RE resources, wind energy are allow as the fastest developing RE resource globally which is reported at a rate of 30% annually. Wind energy is washed and an inexhaustible sanction a cost-effective and sustainable energy system. However, the development and a current

utilization of wind energy in Malaysia are immature due to the fact that the country has a low wind speed. To take account of wind fluctuations, the energy from an air flow over a time period P is made up of the sum of wind speeds of small time intervals. Often, average hourly wind speeds are measured, thus providing 25 time buckets per day. While the air density is more or less constant, the two parameters to watch out for are the windswept area A and the wind speed v. The latter is even more critical, as it is cubed. A location with a double average wind speed has eight times the power for the same area. Or to arrest the same energy, the blades of the wind turbine in the low wind speed location would have to be almost 2 times as long.

5. BATTERY

All independent and utility interface PV frameworks require battery stockpiling. Photovoltaic modules charge the batteries during sunlight hours and the batteries supply the force as its required, regularly around evening time and during overcast climate. Utility intertie PV frameworks supply power straightforwardly to the utility network: no battery stockpiling is required anyway a few inverters currently join highlights which make battery utilize an alternative.

The two most basic kinds of battery-powered batteries being used are lead-corrosive and antacid. Lead corrosive batteries have plates made of lead, blended in with different materials, lowered in a sulfuric corrosive arrangement. Basic batteries can be either a nickel-cadmium or a nickel-iron battery. They have plates made of nickel lowered in an answer of potassium hydroxide. We don't list these battery types in this index in view of their exceptionally significant expense. But since these have up to multiple times the usable existence of lead corrosive batteries, we can supply the nickel cadmium type whenever mentioned. Nickel iron batteries require higher pinnacle voltages to turn out to be appropriately charged than photovoltaic modules will deliver accordingly we don't sell this battery type.

6. Future Work

Further investigations are needed to obtain an optimum configuration and to improve the efficiency of the designed exhaust air energy recovery system. The blockage effect which is caused by the combination of the VAWTs at the outlet of the exhaust air system that may attack the performance of the exhaust air system will first be investigated. It will cover topics such as the exhaust air flow characteristics, fan performance, heat rejection effectiveness, system efficiency, etc. To ensure the normal operation condition of the exhaust air system. Over-heating a problem that may cause a fire or a safety issue from the fan motor a current gain due to an air a flow reduction will be focused upon as well as to ensure safety of the occupants in the building. In an addition, the impact is of a flow was mixing between the exhaust air and the natural turbulence in urban areas which may influence the performance of the system (exhaust air system and an energy a recovery system) will also be included in future studies. Discharged air velocity profile at the cooling tower outlet Table 2 Field test results on an actual cooling tower Parameter Cooling tower only Cooling Tower with wind turbines Percentage Difference Average discharged air speed 10.545 m/s 10.363 m/s 1.73% Cooling tower fan rotational Speed 386.0 rpm 385.8 rpm 0.05% Fan motor power Consumption 7.048 kW 7.075 kW 0.39% Turbine rotational speed 875 rpm (free-running condition)

7. CONCLUSION

An on-site a green energy a generation system that transform the wasted a wind resource from exhaust air systems to the electricity is presented. The design of the exhaust air recovery system is expected to recover 13% of the power consumption by the cooling tower's fan motor. Besides, it is built with a wind power increment features (a guide-vanes and a diffuser-plates) that considerably improve the performance of the VAWTs by accelerating the on-coming discharged an airflow. Based on the test results obtained from the laboratory test, it is proven that the energy in the discharged air is extractable by installing the energy recovery system without affecting its original performance significantly.

The motor current consumption remains at 0.84 Ampere for all the three testing configurations. Meanwhile, the VAWTs' performance has been improved when they are integrated with an enclosure as the turbine rotational speed was raised from 462.72 rpm to 500.95 rpm. Minimum stoppage effect from the designed system was observed during field test since the discharged airflow was reduced by 1.71%. The performance of the VAWT is expected to match its rated power when exposed to this discharged air speed. Also, there was no significant difference on the motor power consumption as it was maintained in between 7.0 to 7.1 kW.

An optimized system with two VAWTs installed on a common cooling tower (2 m outlet diameter and powered by a 7.5 kW fan motor) is expected to recover 1 kW of power. This system is retrofitting able to any exhaust fan air system, which makes it has the highest market potential. The electricity generated can be fed into

the electricity grid or used for commercial purposes. It is a green technology invention with great potential of reducing CO2 emission that leads us to future greener cities. The system optimization and blockage effect investigation will be the next focus of this project. It will take into an account the exhaust air system show, environmental impacts and conformation to building regulations to secure this design is a safe and reliable energy the recovery system.

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