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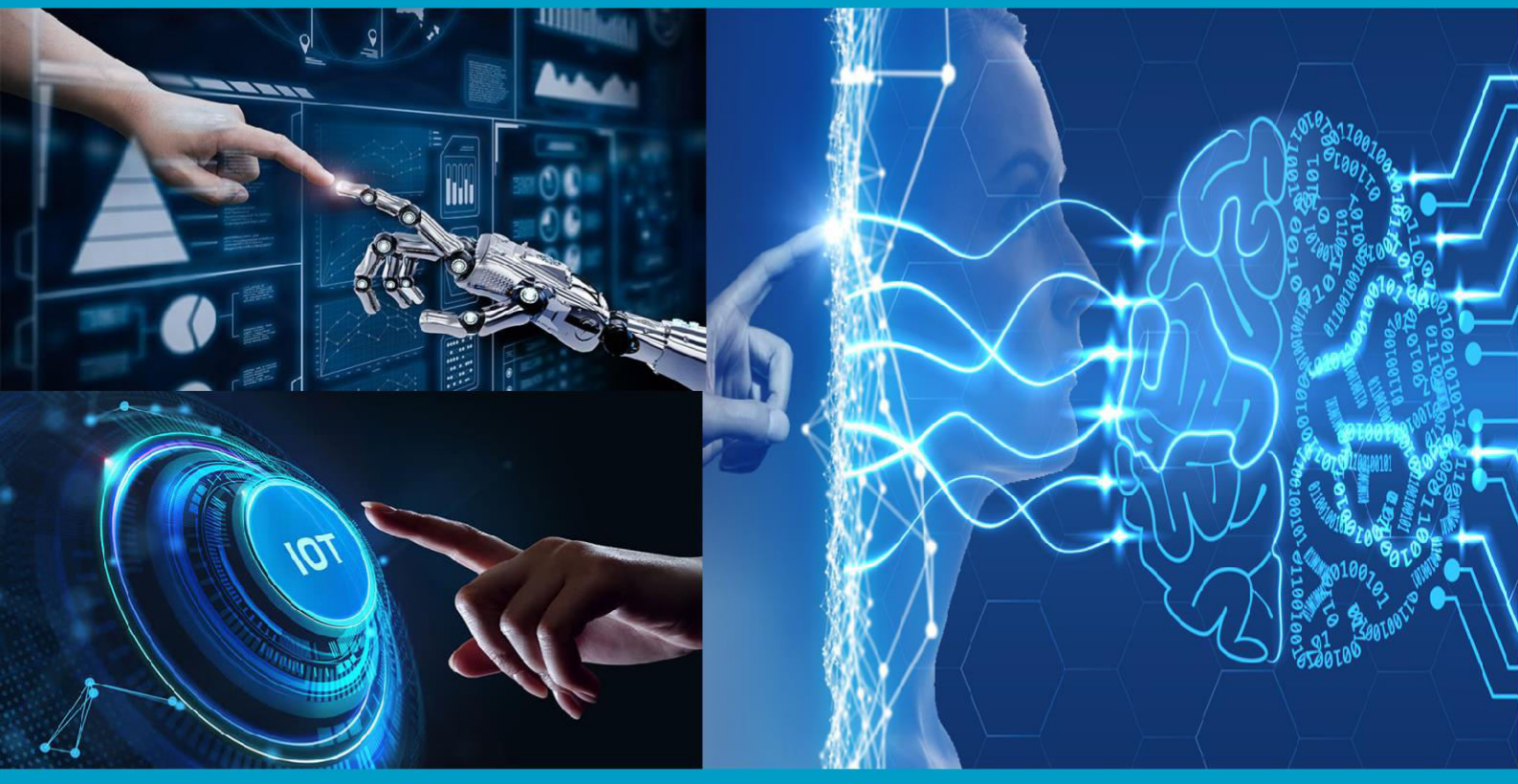

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Electricity Generation Using Rooftop Ventilator

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ABSTRACT: The development of renewable energy potential in Indonesia is actively pursued to conserve alternative energy sources with the depletion of available fossil energy resources. One of the green energies that do not pollute the environment is wind energy. The tropics have a great potential source of wind energy, but until now it has not been optimal enough to be used to generate electricity. The use of the energy generated by the wind consists in converting it into mechanical energy using wind turbines. In addition, the mechanical energy of the turbine is used to drive a DC generator to generate electricity. Rooftop Fan (RTV) As a simple application in this study, a wind turbine fan mounted on the roof of a house is used as the wind turbine. The fans move when the wind touches their blades, sucking the air out of your home. The fan shaft is connected to the DC generator via a pulley and a V-belt. So when the fan spins, the generator also spins and produces electricity. The aim of this study is to meet the energy needs of domestic lighting. The results of experimental studies show that the use of fans works well as an alternative to using wind energy. The electricity generated can be consumed or stored in batteries.

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I.INTRODUCTION

The electricity can be generated by using two sources which can be renewable and non-renewable sources. Non-enewable sources are those sources which uses fossil fuels to generate the electricity such as oil, coal, natural gases. These resources cause the pollution to the environment. Renewable energy includes solar energy, geothermal energy, and tidal energy. These resources have many advantages such as it requires less maintenance also they do not cause pollution to the environment therefore government has to develop small power station for generation of electricity. One of the methods for generation of electricity is by roof top ventilator. The main function of the roof top ventilator is to provide the ventilation. There are two types of roof top ventilator which is motor driven and natural air driven. So this paper is about the second type which is natural air driven. The main component of RTV system are DC motor, battery, inverter etc. which convert the kinetic. energy from the warm air to the electricity for our usage. The new idea to improve the ventilator speed an electrical production is to add the additional fins. This free electricity has to use to charge the battery. By using this electricity we can drive the small appliances such as light or as per requirement. To drive this application we have to use the inverter to convert DC supply into AC supply. Roof ventilator does not require external power connection and does not consume any power units. The roof ventilator works on the principle of flywheel and once the flywheel gets momentum it keeps on rotating. The popularity of renewable energy has experienced a significant upsurge in recent times due to the exhaustion of conventional power generation methods and increasing realization of its adverse effects on the environment. The exploration of renewable energy is the only approach to reduce our dependence on fossil fuels. Among the renewable energy sources Wind Energy is one of the fastest growing energy sources which is growing at the rate of 30% annually. Wind energy was first harvested centuries ago, when early windmills were used to power millstones, pumps, and forges. More recently, the wind is harnessed by using a special collector, called wind turbine to produce a clean, safe source of electricity. Various designs have been proposed in order to create a high efficient wind turbine which will be able to generate maximum electric power. They may vary either in the design of shape of the turbine blades, the axis of rotation, and other useful modification. The wind speeds in most of Asian zone is much lower than 7 m/s, especially in the cities, but the mechanical frictional resistance of existing wind turbines is too big, usually it can't start up when the wind speed is not big enough. This paper introduces structure and rinciple of the proposed wind turbine for better utilization of wind energy. Maglev Wind turbine has the features of no mechanical contact, no friction etc. minimizing the damping in the magnetic levitation wind turbine, which enables the wind turbine start up with low speed wind and work with breeze. The wind . turbine, which was first unveiled at the Wind Power Asia exhibition in Beijing, is expected take wind power technology to the next level with magnetic levitation . The aim of this major qualifying project is to design and integrate an advance technique, into turbine system in order to increase the efficiency. 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. Since one of the main complaints about

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wind turbines is the sound they produce, this is a huge advantage over other turbine designs.

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FIGURE. 1: ROOFTOP VENTILATOR

II.LITERATURE REVIEW

Wind is known to be another form of solar energy because it comes about as a result of uneven heating of the atmosphere by the sun coupled with the abstract topography of the earth's surface. With wind turbines, two categories of winds are relevant to their applications, namely local winds and planetary winds. The latter is the most dominant and it is usually a major factor in deciding sites for very effective wind turbines [3]. There are some reasons to support in using the wind energy to produce electricity power. Wind power available in the atmosphere is much greater than current world energy consumption. The exploitation of wind power is only limited by the economic and environmental factors, since the resource available is far larger than any practical means to develop it. Renewable energy produced from the wind has attracted a lot of attention and support in recent years. However, this green energy is often criticized for its low output and lack of reliability. The basic working principle of a wind turbine is: When air moves quickly, in the form of wind, and their kinetic energy is captured by the turbine blades. The blades start to rotate and spin a shaft that leads from the hub of the rotor to a generator and produce electricity. In general, they are two types of wind turbine according to the axis they are rotating about. Horizontal axis wind turbine (HAWT) is the type of wind turbine which has a main rotor shaft and electrical generator at the top of tower and pointed to the direction of wind. Most of them possess a gear box which turns the slow rotation of turbine blades into faster rotation that is more suitable to drive an electrical generator. As for the Vertical axis wind turbine (VAWT) consists of generator and gearbox which are placed at the ground and thus there is no need for a tower to support them as in HAWT. The main rotor shaft is arranged vertically to allow the turbine blades rotate without facing to the direction of the wind. In VAWT system, the generator and gearbox is placed on the ground rather than on the top. There is no need of the support from a tower make it more accessible for maintenance. Magnetic levitation (maglev) is a method in which an object is suspended with no support other than magnetic fields. The magnetic force produced is used to counteract the effects of the gravitational force and lift up the object. By placing these two magnets on top of each other with like polarities facing each other, the magnetic repulsion will be strong enough to keep both magnets at a distance away from each other. The force created as a result of this repulsion can be used for suspension purposes and is strong enough to balance the weight of an object depending on the threshold of the magnets There are many advantages for utilizing magnetic levitation that is to minimize friction, make force measurement, design, and entertaining devices. Recently, this advance technology is applied into transportation system in which non contacting vehicle travel safely at very high speed while suspended, guided, and propelled above a guide way by magnetic fields. The concept of magnetically levitated vehicle stimulates the development of useful application in various fields such as the power generation. The vertically oriented blades of the wind turbine are suspended in the air above the base of the machine by using permanent magnet which produces magnetic force to lift up the blades. This system does not require the electricity to operate because no electromagnets are involved. Since the turbine blades are suspended by magnetic force produce by the permanent magnet, there is no need of ball bearing to retain the blades. This allows the friction between the blades and ball bearing can be reduced significantly and thus, minimizes the energy loss. This also helps reduce maintenance costs and increases the life span of the generator. The basic understanding of a generator is that it converts

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mechanical energy to electrical energy. Generators are utilized extensively in various applications and for the most part have similarities that exist between these applications. Over the years, alternating current has been the common choice of power supply. AC is popular because the voltage can be easily stepped up or down using a transformer. Due to the inherent properties of a transformer, DC voltage cannot be altered using this type of equipment. Transformers operate due to a changing magnetic field in which the change in magnetic flux induces a current. With the AC flux generator design, its operability is based on permanent magnet alternators where the concept of magnets and magnetic fields are the dominant factors in this form of generator functioning. These generators have air gap surface parallel to the rotating axis and the air gap generates magnetic fluxes perpendicular to the axis. As a efficient upgrade this project prefers an advanced technique, Magnetic levitation for Wind Energy Power Generation. Maglev wind turbines have several advantages over conventional wind turbines. They're able to use winds with starting speeds as low as 4.5 meters per second (m/s). Also, they could operate in winds exceeding 40 m/s.

III. IMPLEMENT DETAILS

The research method used is by conducting literature studies, making prototypes, measuring electric current, voltage, and generator rotation connected to the roof ventilator from wind gusts during loading, for more details are described as follows. The first stage in this research method, begins with researchers interested in conducting literature studies of several references regarding ventilator turbines at low wind speeds, which can be used as alternative power plants. Then the research method was continued by conducting a survey for the specified location,. Furthermore, the next stage is to measure the wind speed around the residence. The second step is to select the type of ventilator turbine and design a prototype, determine the need for the controller circuit, select the inverter and accumulator. Then proceed to the third stage, namely evaluating the system design. Furthermore, the fourth stage is measuring and testing the feasibility of the device that will be installed on the roof of the residential later, if it has followed the design and produces the minimum power generated as an alternative power plant as residential lighting. The realized tool assembly is then tested and tested, if the device experiences problems, then repairs are made to the point where the problem is by repeating the repair process. Meanwhile, if the tool is in accordance with the plan and there are no obstacles, then the process of taking data is carried out to measure the wind speed of the rotor rotation, current, voltage and the function of the tool performance. After that, the implementation of these stages is carried out by installing the prototype on the roof. A generator is machine that converts mechanical energy into electrical energy by using principle of magnetic induction. In this system we are going to use dc generator a dynamo which is connected with gear assembly. The rpm decides the current induced in coil which generates the voltage. The output voltage is directly proportional to rpm.

FIGURE 2. DC GENERATOR

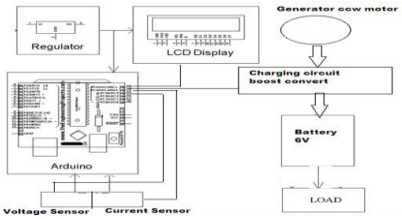

FIGURE 3: CIRCUIT DIAGRAM

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The terms "wind energy" and "wind power" both describe the process by which the wind is used to generate mechanical power or electricity. 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. A wind turbine turns wind energy into electricity using the aerodynamic force from the rotor blades, which work like an airplane wing or helicopter rotor blade. When wind flows across the blade, the air pressure on one side of the blade decreases. The difference in air pressure across the two sides of the blade creates both lift and drag. The force of the lift is stronger than the drag and this causes the rotor to spin. The rotor connects to the generator, either directly (if it's a direct drive turbine) or through a shaft and a series of gears (a gearbox) that speed up the rotation and allow for a physically smaller generator. This translation of aerodynamic force to rotation of a generator creates electricity. To convert kinetic energy from the wind into electrical energy, it can be done with the use of wind turbines. Then in the presence of a wind ventilator that has a structure like a turbine, it is usually used at home or industry to suck air from inside the house or industry. This ventilator will move if there is a wind blowing on the blades and at the same time will suck air in the building outside . With the similarity in the structure of the wind ventilator to the turbine, it can be engineered so that it can function as a wind turbine.

FIGURE 4. INTERFACING OF MODEL

After the prototype is fabricated, the test is carried out for the ventilator on no-load test, while the measurement data is shown The lowest wind speed data is 2.14 m/s which results in the generator speed is 188 rpm and output voltage is 3 V.

IV.SYSTEM PERFORMANCE

The main objective of the rooftop ventilator is to provide the ventilation to the room and secondary the electricity generation. The generation is achieved by dc generator and it is pass through the reverse polarity circuit in case to avoid the back flow of power. The voltage regulator gives the constant voltage to the battery charger. There are many rooftop ventilator are available in the market with different size and variable no of blade and its arrangement. The spinning ventilator is connected with a mechanism to transfer mechanical power to generator. The performance of the dc generator is relay on the varying wind speed. The different modes of operation can be used depending on wind turbine configuration. Fixed speed and variable speed operation. Fixed speed operation is simple so having low cost, but it does not provide optimal efficiency. In case of variable operation, maximum efficiency is obtained the system is controlled to maximize the power extracted from the wind. This allows the friction between the blades and ball bearing can be reduced significantly and thus, minimizes the energy loss.

V.TEST PROCEDURE

Test 1: The starting wind speed of wind turbine model

1. The model is assembled to be the wind turbine

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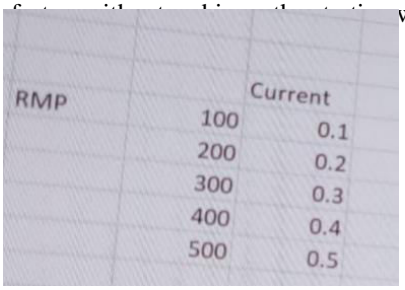
2. A fan is placed in the direction parallel to the wind turbine model.
3. The fan is switched on and the wind produced is directed to the model.
4. The model is replaced by anemometer and the fan is switched on again. The wind speed is recorded
5. The test is repeated by using conventional wind turbine model.

Test 2: The rotational speed of wind turbine model at constant wind speed

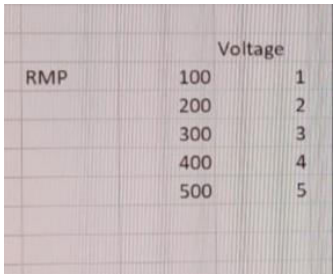
1. The steps 1 until 4 in test 1 are repeated.
2. The reading of rotational speed of model is recoded after 1min for 5 times.
3. The test is repeated by using conventional wind turbine model. The distance between the maglevand conventional wind turbine model with the fan is made sure to be the same.

From the test 1, the roof top vent wind turbine model starts to rotate at lower wind speed than that of conventional wind turbine..Most of the existing wind turbine requires high starting wind speed to operate. It take a longer time to stop its rotation completely compare to conventional one. This test is carried out under the same wind speed. The wind may come to a lower speed and even stop at every instant of time. Higher stopping time is desired because the wind turbine can still rotate at lower speed in longer time when the speed of flowing wind decrease. And when the wind speed increases, the wind turbine immediately rotate [illegible] wind speed (if wind turbine stop in few seconds).



RMP	Current
100	0.1
200	0.2
300	0.3
400	0.4
500	0.5

FIGURE 5. GENERATED CURRENT



RMP	Voltage	
	100	1
	200	2
	300	3
	400	4
	500	5

FIGURE 6.GENERATED VOLTAGE

VI. CONCLUSION

FIGURE NO 7. COMPLETE SYSTEM

The system manages to generate the power from ventilator and to produce the micro generation system. The system also

manages to charge battery efficiently. The electricity generated is directly proportional to the speed of wind. Modification of the roof ventilator as an alternative mini electrical power plant has been successfully developed and tested at the location of engineering lecturer housing of the Indorama polytechnic. The results gave the relationship between wind speed and voltage and electric current generated by the generator. The lowest wind speed at that location is 2.12 m/s and produces generator speed, electrical voltage and electric current.

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