



The Implementation of Turbine Ventilator as an Alternative Power Plant

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Abstract

Indonesia is actively developing the potential for renewable energy as a substitute for depleting fossil energy reserves. Wind energy is clean energy without polluting the environment. Wind energy in Indonesia has great potential, but it is still not optimal enough for its utilization. One form of alternative energy that can be utilized as mechanical energy by wind turbines to convert into electrical energy by dc generators. Ventilators that operate for 24 hours function to suck water and, located on the roof of a warehouse, sports hall. Utilization of wind to become electrical energy is designed from the use of a turbine ventilator as a medium to convert wind into motion energy, where the movement of the turbine is continued by pulley and v-belt comparisons to the generator, this generator produces electricity. This research examines how much electrical energy is produced at different wind speeds ranging from 3 to 5.4 m/s. From the tests conducted, the generator rotation, and the lowest voltage is at wind speed of 3 m/s which is 3.6 V. While the generator speed and the highest voltage is obtained if the wind speed is 5.4 m/s which is 10.3 V.

Keywords: wind energy, turbine ventilator, dc generator.

I. INTRODUCTION

The need for energy in the world in general and Indonesia, in particular, continues to increase because of economic growth and energy consumption due to population growth. Wind is one of the potential natural resources as an alternative and environmentally friendly energy and is renewable so that there are huge opportunities for development [1], [2].

Electrical Energy is a very important need, but the electrical energy we use today still comes from conventional power plants that have negative threats such as pollution and fossil fuel reserves that are decreasing. To overcome this, by utilizing alternative energy that is environmentally friendly, one of them is wind energy and solar energy [3].

To convert kinetic energy in the wind into electrical energy, a wind turbine is needed. By utilizing the wind energy as a propeller in ventilation turbines that are often used and located in the roof of buildings that function as ventilation of residential and industrial buildings [2], [4].

It is a tool that works to circulate the air in the room such as a roof fan. Unlike the case with fans such as exhaust fans that require electric power while the turbine ventilator is driven by wind [5]



Figure 1. Turbine ventilator [6].

Even weak winds or high-speed winds can spin the fins so that indoor air can escape. This can be seen in Figure 2. Ventilator turbines mounted with gusts of wind in their environment can remove hot air from the room and can flow up and press out through the fins [7].

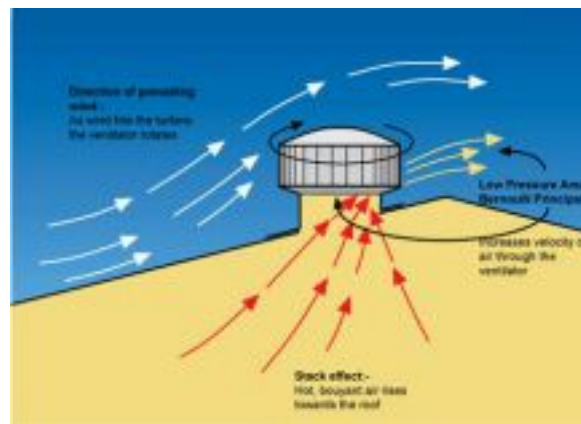


Figure 2. Principle of the performance of Turbine ventilator [6].

II. RESEARCH METHODS

It is a stage that starts with studying the literature and continues with surveys for two different locations namely the location in front of the Electrical Technology Study Laboratory building, and the second location in the park area near the Vocational Training Center building, Indorama Engineering Polytechnic as well as measuring the existing wind speed. The second step is to choose a ventilator and design the seat, determine the needs of the controller circuit, the inverter and the accumulator selection. The third stage is to evaluate the system design, then the fourth stage is to measure and test the feasibility of the device if it is following the design and produces the planned power.

The assembly of the realized tool is then tested on the tool, if the device experiences problems with the initial plan, then repair is made to the point that becomes an obstacle by repeating the assembly process. Meanwhile, if the tool is following the plan and there are no obstacles, then the process of taking data measurement of wind speed rotation of the rotor, current, voltage and the performance function of the tool.

The duration of the research has been carried out within 5 months, starting from the signing of the research contract. The research location is to test the equipment that has been carried out at two locations, namely in front of the laboratory building (location A), the Electrical Technology Study Program and in front of the Vocational Training Center building (location B), the Indorama Engineering Polytechnic.

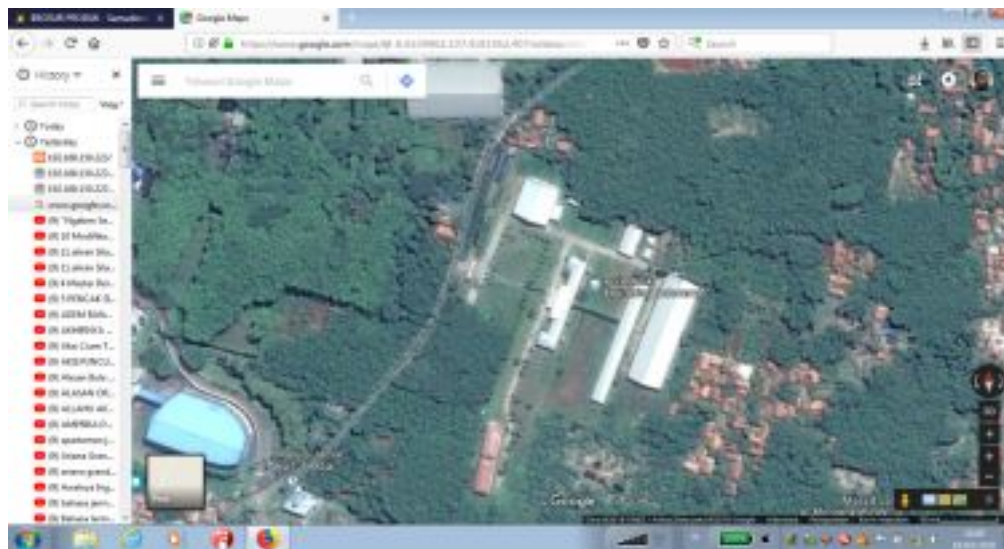


Figure 3. Location of Wind Measurements at The IIndorama Engineering Polytechnic (107 O 25'06.0 "East Longitude and 6 O 33'12.1" South Latitude)

III. RESULT AND DISCUSSION

From the survey results of the two locations, location B which is a wind condition that has wind potential for electricity generation. After determining the wind potential at the location B the measurement results obtained for testing without a load as shown in table 1 as below.

Table I. Measurement No-load on location B

No-Load Testing																													
Wind Voltage. Current Rotation.																													
Speed.																													
Measure to																													
Gen.																													
(m / s) (V) (mA) (rpm)																													
1	5.3	10.4	0	159	2	5.3	10.3	0	157	3	5.3	8.6	0	147	4	5.0	8.6	0	133	5	4.9	8.5	0	128	6	4.8	4.9	0	113
7	3.5	4.8	0	90	8	3.4	4.7	0	77	9	3.4	4.2	0	74	10	3	3.6	0	70	Avg	4.39	6.86	0	115					

Furthermore, the burden test with wind potential at location B is obtained, the measurement results for the load test are shown in table II as below.

Table II. Measurement Loading on location B

Test Loading												
Wind Voltage Current Rotation.												
Speed.												
Measure to												
Gen.												
(m / s) (V) (mA) (rpm)												

1	5.4	9.7	1.1	159
2	5.1	9.2	1.1	148
3	5.1	9.1	1.0	145
4	4.1	7.0	0.8	110
5	3.8	5.9	0.6	104
6	3.8	5.3	0.6	101
7	3.7	4.3	0.5	95
8	3.5	4.0	0.4	59
9	3.3	3.4	0.3	53
10	3.3	2.4	0.2	49

Avg 4.11 6.03 0.66 102.3

For more details, graphs are presented as shown below. Figure 4 is a graph of wind speed in the no-load test of the generator speed, voltage, and current generated. No-load stresses are indicated in blue, while brown loads are present. It can be seen that the lower the wind speed, the less voltage will be produced for no-load conditions.

Furthermore, in Figure 5 is a graph for the generator rotation generated under load conditions indicated in blue while in the presence of a light green accumulator. It appears that the lower the wind speed produced, the smaller the load condition.

The picture 6 is a ventilator as a power plant that has been tested at different locations, but for the feasibility of generating electricity obtained location B which allows producing optimal electricity generation.



Figure 6. Ventilator as a Power Plant.

IV. CONCLUSION

Utilization of the ventilation turbine as an alternative power plant can produce electricity generation at the test site in front of the Vocational Training Center building. The effect of wind speed on the voltage and current generated by the generator, where at the lowest wind speed of 3.3 m/s produces a voltage of 2.4 V and a current of 0.2 mA and at the highest wind speed of 5.4 m/s produces a voltage of 9.7 V and a current of 1.1 mA are loaded.

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