Genration of Energy from Rooftop Airflow Ventilator

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INTRODUCTION:

In upcoming years the generation of non-renewable energy may get reduce in terms of non- renewable resource availability. The only option is to use renewable energy instead non-renewable energy. The main concept is generate the power from roof top turbine. The roof top turbine is works with wind flow. Earlier we used renewable as a solar panel ,windmill and using more technology. In addition the energy is developed from roof top turbine. To avoid this problem and save the energy we have proposed the new methodology called "GENERATION OF ENERGY FROM ROOFTOP AIRFLOW VENTILAT0R" for generating the power using renewable source wind

Abstract:

The testing apparatus was conducted with wind speeds from 0-14.0 m/s, incremented by 0.2 m/s each iteration, where the test results show that the rooftop ventilator self-starts at a wind speed of 0.4 m/s and minimal charged speed was recorded at 28.3 RPM at a voltage of 7.82 VDC (activated charging voltage via battery bank of two 12 V, 1.5A—in parallel connection) at 44.36 RPM. Then, it reaches ceiling voltage of 13.2 VDC and 0.56 ADC at turning approximately 56 RPM in which it produces 10.24watts power. At cut- out speed of 14.0 m/s and also rated output speed, the RTV optimizes the turning at 95.6 RPM while generating 1.3 ADC, in which it produces a maximum power output of 26 watts. For the modes of finance; ROI remarks at 6.21, payback period at 4.03 years, and cost per kWh is as low as 1.28 rupees/kWh, assuming operating at average speed of 14.0 m/s all year long.

OBJECTIVE:

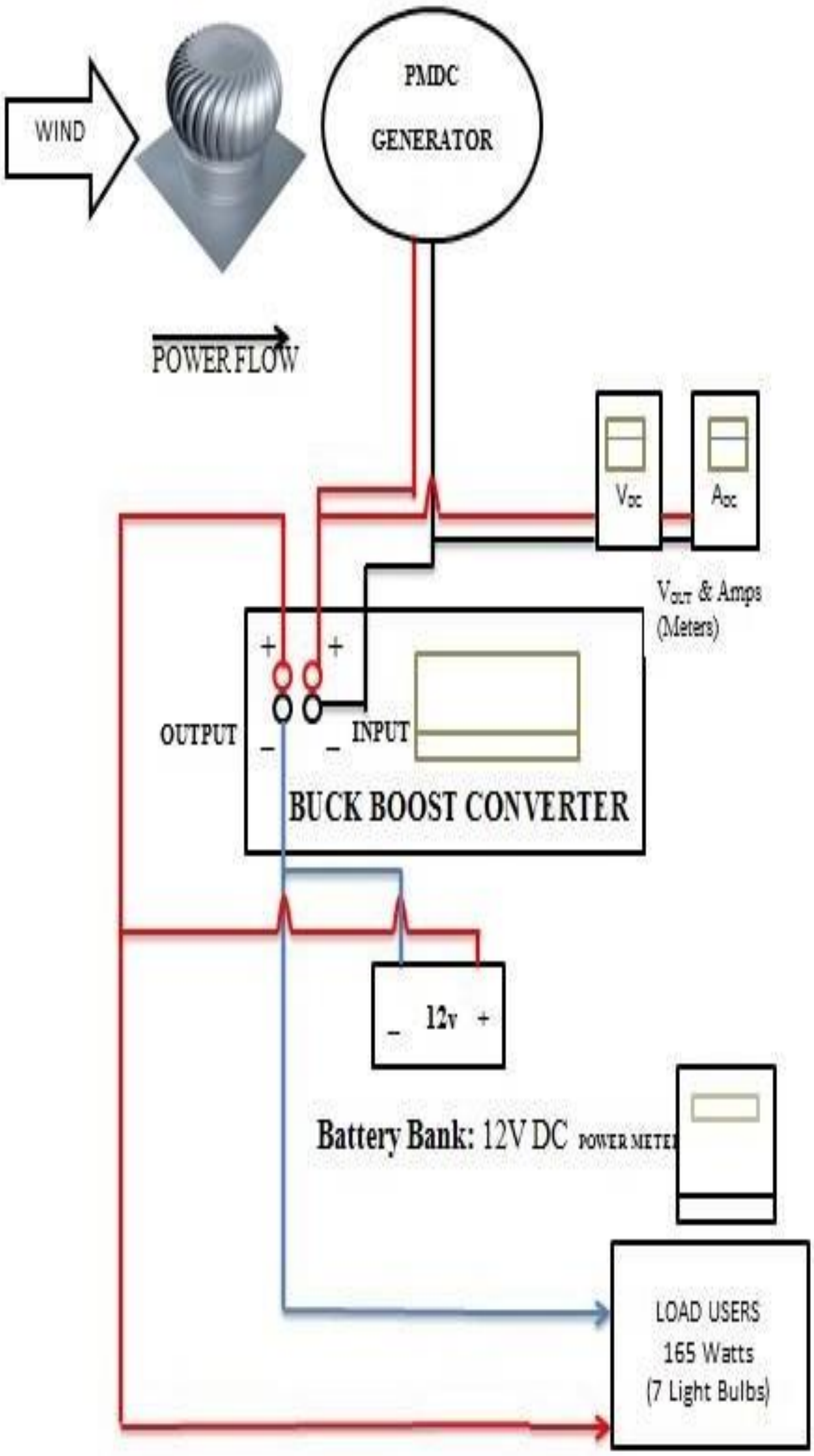
- To generate the power from rooftop ventilation, their by charging the battery and supply power to applications.
- To introduce the charging technology from rooftop turbine ventilation which is mainly used industrial lighting without any external supply.
- To run the generator from natural air through rotating rooftop turbine to obtain the electrical energy.

BACKGROUND KNOWLEDGE:

With various research and development being focused on, these must be coupled along with current wind generation situation in country. First, the country's average wind speed is under 7 m/s, whereas current installed HAWT capacity operates at beyond 8 m/s .Secondly, wind intermittent resource in country causes HAWT to be unable to reach its designated performance and barely generate electricity for some hours in a year.

As Mertens remarks on alternative to produce wind energy close to points of uses .Bhutta et al. suggest VAWT can be economical viable for remote zones away from grid transmission lines. Allen et al. remark that micro-generation is a solution to transmission and distribution losses . And Mithraratne suggests that distributed micro-generation systems can provide generation at the point of uses and lower major investments for grid transmissions . Westerholm recommends power storage and distribution systems to provide wind power on demand for economic benefit, particularly in the absence of wind . Even that, Khan et al. illustrate the use of motor-driven to keep rooftop ventilator rotating in the absence of wind.
respond to wind perturbations Fernandes et al. site that it is downtime of wind turbines' gearbox failures that present a problem, this causes excessive repair and adds up operational costs. Since, main causes of power loss in the gearbox indicate rotational friction loss in the gearing and bearing mechanisms. To minimize that friction loss is to simplify the design of the direct- drive rotor. This may be improved by low friction and torque properties from magnetic bearing .
Therefore, for the design of the turbine rotor, as to enable and prolong the turbine to turning as much hours for all year long. Nayar et al. point out that an ability to extract more power, is an ability to

DESIGN:


WIND
PMDC
GENERATOR
POWER FLOW
V_{DC}
A_{DC}
V_{OUT} & Amps
(Meters)
OUTPUT
INPUT
BUCK BOOST CONVERTER
12v
Battery Bank: 12V DC
LOAD USERS
165 Watts
(7 Light Bulbs)

:

CONFIGURATION AND TECHNICAL SPECIFICATIONS:

Configurations	Specifications
Full-Scale Prototype	Rooftop airflow ventilator
Type	VAWT / Air-Flow out Ventilator
Generator Output	24v DC
Generator Type	PMSG (DC)
Diameter of Turbine	24 inch (610 mm.)
Height	480 mm. (w/o rooftop stand)
Materials	Aluminum / Zinc / Steel

Turbine Spoke	6 spokes
Total Weight	6,600 g.
Operating Life	25 years
Maintenance	Maintenance-free
Start-up Wind Speed (also cut-in wind speed)	0.4 m/s.
Cut-out Wind Speed (also rated output speed)	14.0 m/s.
Operational Range	0.4-14.0 m/s.
Minimal Charged Speed	7.8 m/s.
Minimal Charged Turbine Speed	28.3 RPM
Rated Voltage (charged)	12 VDC
Battery Bank	12 Volts 1.5 A.

Configurations	Specifications
Turbine Body	Aluminum39 airfoil curved-vanes
Turbine Spoke	6 spokes (steel)
Turbine Lid	Zinc
Net Weight	2,500 g.
Turbine Base	Zinc
Internal Frame	Corrosion-resistant steel
Base Arm	3 arms (steel)

Net Weight	4,100 g.
Turbine Rotor	Corrosion-resistant steel
Length	135 mm.
Outer Race Diameter	15 mm.
Turbine Stator	Corrosion-resistant steel
Width (thickness)	40 mm.
Outer Race Diameter	170 mm.
Output Controller	Charging Controller (for solar PV)
Turbine Cost (unit cost)	8,000 rupess exclude battery bank system
Variable-Speed	12-24v dc

PROCEDURE FOR TESTING:

The testing procedure is an experimental procedure based on power output profile, so as to find starting-up speed, cut-in speed, rated output speed, and cut-out speed. The testing rig was then arranged for measuring variable wind speeds. The RTV was mounted on top of a rooftop stand whereas it was positioned directly in front of an air outlet (diameter:

1.00 m., area: 0.785 m^2) with a variable-speed industrial fan . An adjustable rack of anemometer(s) and digital photo tachometer were positioned in front of the air outlet to measure the wind speed in m/s and revolution per minutes (RPM). Also, digital voltmeter and ammeter were connected to the testing rig. Then, wind speed iterations were run and measured each time, in which was incremented by 0.2 m/s. Noting that for finding initial starting-up speed, by gradually started wind speed from 0 m/s for several trials until the RTV starting to actuate and the average of wind speeds was recorded.

Four readings parameters were measured using; anemometer(s), digital tachometer, and digital voltmeter and ammeter. The first two parameters were carefully taken at the very front of the RTV position and the latter were taken at a spot output location of buck-boost converter .The adjustable rack of anemometer(s) was attached very close in front of the air outlet. This aims to minimize error from wind decreasing velocity. The tachometer was placed close to its reflective tape attached on the rim of the turbine body so as to compute the RPM. Then, parameters obtained each iteration from 0 until 14.0 m/s (0 - 71 iterations) were calculated.

This must be noted that, the testing rig was prepped and tested inside the laboratory with no site monitoring in the outdoor. Then, a preliminary error analysis was made neglecting of turbulence flow or air lifting-flow under rooftop stand. And assume laminar air- flow velocity and slightest amount of wind directional change in the laboratory. Also, assuming average atmospheric ambient air density of

1.22 kg/m^3 , and ambient temperature was recorded at 32 °C.. This expected error was being taken care of by running several trials of wind speed before obtaining the average readings each time.

In addition to that, the wind generation system was constructed primarily to contribute to this case study as the RTV (and rooftop stand) are mounted on top of this system . This system is accountable only an electrical discharging part, in which the system consists of buck-boost converter, a charging controller (for solar PV), battery bank of 12 Volt 1.5 A, pieces of equipment through a household light panel .

In principle, the power flow is converted from wind kinetic energy into the PMSG (24V 1.5A) as of direct current (DC) and then fed into the charging controller. Then, the DC current was obtained from this point as to calculate actual power output.

CONCLUSION:

This case study re-designed, constructed and tested the RTV prototype based on wind turbine power output profile. The RTV mechanical characteristic shows a low self-starting speed of 0-14.0 m/s, incremented by 0.2 m/s each iteration, where the test results show that the rooftop ventilator self-starts at a wind speed of 0.4 m/s and minimal charged speed was recorded at 28.3 RPM at a voltage of 7.82 VDC (activated charging voltage via battery bank of two 12 V, 1.5A—in parallel connection) at

44.36 RPM. Then, it reaches ceiling voltage of 13.2 VDC and 0.56 ADC at turning approximately 56 RPM in which it produces 10.24watts power. At cut-out speed of 14.0 m/s and also rated output speed, the RTV optimizes the turning at 95.6 RPM while generating 1.3 ADC, in which it produces a maximum power output of 26 watts.

This concludes that the RTV may still be insufficient in term of the power output at the low- speed wind ranging from 0.4-4.0 m/s. However, from 4.0-8.0 m/s range, the RTV can trigger stabilized charging level at 7.8 m/s easily while producing approximately 3.38 watts at turbine turning 44.36 RPM. And from 8.0-

14.0 m/s, the RTV reached out its full performance with the modes of finance; ROI remarks at 6.21, payback period at 4.03 years, and cost per kWh is as low as 1.28 rupees/kWh, assuming operating at average speed of 14.0 m/s all year long.

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