

ELECTRICITY GENERATION FROM ROOFTOP VENTILATOR

¹Sachin Salunke, ²Sunil Jadhav, ³Shubham Dhakne, ⁴Prof. Jagruti Solanke

¹Student, ² Student, ³ Student, ⁴Assistant Professor,
¹Department of Electrical Engineering JNEC, Aurangabad, India.

Abstract: The electricity become highly important part of human life. Due to increasing demand of electricity the gap between demand and supply is increasing day by day. Electricity basically generated from fossil fuel and its sources are non-renewable and their availability is limited. Using of Renewable energy for electricity generation in today's situation is must to bridge gap between demand and supply. In this paper, proposed system based on harnessing wind energy to generate electricity by using rooftop ventilator as wind turbine and suitable generator system. Rooftop ventilator is installed at roof of industries, high tower buildings, godowns and it is used for ventilation purpose and does not consume electricity for its operation. In proposed system we can generate small amount of electricity which can used for operating small devices like LED lightning load, charge small battery.

Index Terms – Rooftop Ventilator, Permanent Magnet Generator System.

I. INTRODUCTION

The electricity generation from coal and hydro power plant unable to bridge demand and supply gap. The fossil fuel availability is limited and non-renewable type that is cannot be reused again and again and hydropower is highly depend on rainfall and availability of water. Renewable energy such as wind, solar are available free of cost and availability is unlimited. In proposed system wind energy is used for electricity generation. The rooftop ventilator is basically used for ventilation purpose. It is installed at rooftop of industry, godown to exhaust hot air from inside area to outside area. The RTV doesn't require any electrical energy, it rotates by surrounding air and natural temperature gradient. The inside air has high temperature and outside air has low temperature and air flows from high to low temperature and density of inner air is decreased and fresh air is come inside and decrease the temperature of inner area. RTV has two parts stationary and rotary. In proposed system stationery is used as stator and rotary part is used as rotor of permanent magnet AC generator. In propose system magnets are placed on rotary part and wined core is placed on stationary part. When RTV start to rotate, the magnets rotate around the winding core and magnet generate rotating magnetic field, this rotating magnetic field is cut by winding place on core of ceiling fan and due to faraday's law of electromagnetic induction whenever change in magnetic flux link with the coil EMF is induced in it. This induced EMF in winding is carried out by connecting end terminals of winding to wire.

II. BLOCK DIAGRAM

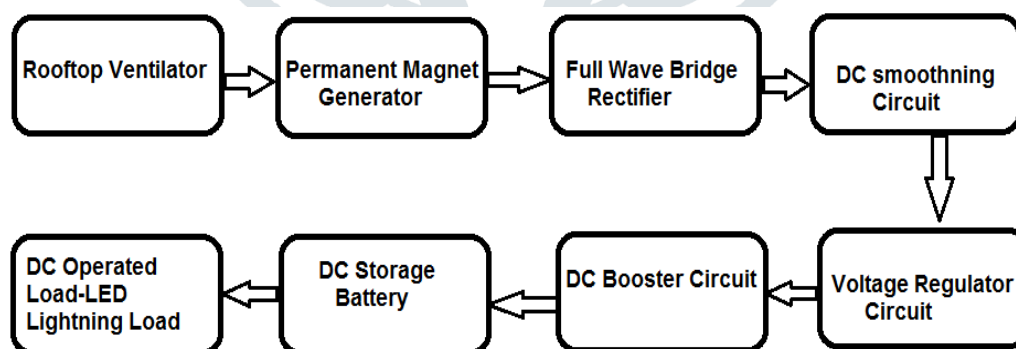


Figure 1 Block Diagram of System

The electricity generation from RTV is shown above. Permanent magnet AC generator is coupled with RTV. When RTV rotates due to surrounding wind or when air flows from high to low temperature through means of RTV, the magnet placed on rotating part of RTV produces rotating magnetic field and winding placed on stationary part which cuts magnetic field and voltage is induced in it. This induced voltage is AC given to full wave bridge rectifier and output of full wave bridge rectifier is pulsating DC and by using filter circuit it given to voltage regulating IC and output of voltage regulating IC is connected DC step up circuit and output of DC booster circuit is connected to battery to charge the battery. The LED lightning load is connected to battery. In this way electricity is generated to supply small load.

III. HARDWARE AND DESIGN

1.1 Rooftop ventilator

RTV is the device used at many industrial, commercial and institutes building. Rooftop used to enable the air flow smoothly over the building. The high pressure air whose temperature is high and in order to transfer the hot air outside of the room through RTV is used. Also the RTV is rotated by slight air breeze outside of the RTV. It rotates irrespective of the direction of the breeze. More will be the fins more will be the speed of the rotation and efficiency of the rooftop.



Fig 2 Rooftop ventilator

1.2 Permanent magnet generator

In this permanent magnet generator ceiling fan core is used. Ceiling fan is commonly used appliance consuming 230-volt single phase.

To transform it into permanent magnet generator some changes are necessary. As in the fan motor there are seven pole pair winding and auxiliary winding mounted on the rotor. The starting coil is not required in the alternator it must be removed from the core. Running winding has 250 turns per slot with standard wire gauge number 29 and wounded as Lap winding. The customized rotor is designed to provide slot for placing magnet and alignment with stator pole. The customized rotor is mounted with Neodymium N52 magnets with dimensions 4.5*1.5*1.25 cm. The model is open to air. In design constraints water insulation is improved by the rubber strips to seal the possible water entrances.

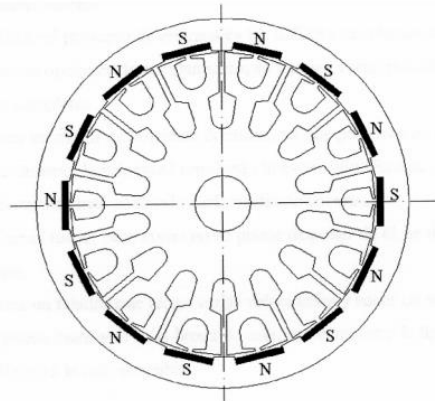


Fig 3 Permanent Magnet Generator

1.3 Full Wave Bridge Rectifier

Full wave bridge rectifier is used to convert generated AC into DC. Output received from the rectifier has both AC and DC components AC component is undesired and causes pulsation in output.



Fig 4 Full Wave Bridge Rectifier

1.4 Filter Circuit

Filter circuit is used to remove the AC component in the obtained DC from the output of full wave bridge rectifier. The filter circuit is used to filtering AC component by using capacitor or capacitor inductor combination. Smoothing of pulsating DC waveform is done in filter circuit.

1.5 Voltage regulator

Voltage regulator IC maintain voltage at a constant value. The IC 7805 has input between 7 to 35 volt. And the output obtained lies between 4.8 to 5.2 volt.

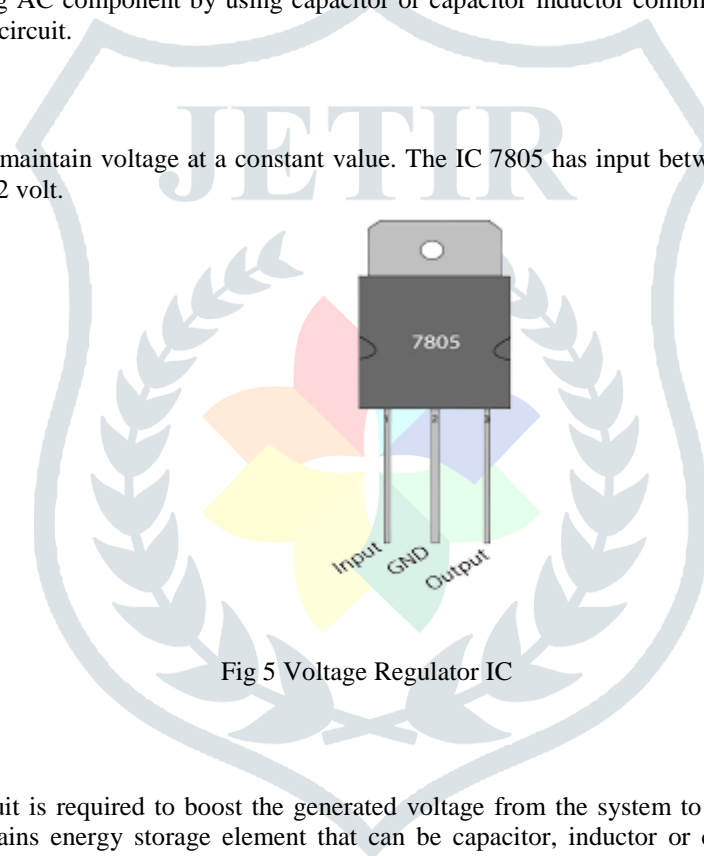


Fig 5 Voltage Regulator IC

1.6 DC Booster Circuit

The DC booster circuit is required to boost the generated voltage from the system to feed load with required voltage. typically, booster circuit contains energy storage element that can be capacitor, inductor or combination of both arranged in circuit.



Fig 6 Dc Booster Circuit with Filter

1.7 Battery

Battery is used to store the energy obtained from the RTV. when the system is unloaded battery charges and when system is loaded both the system and battery feeds to the load.



Fig 7 Battery

IV. ACKNOWLEDGMENT

We would like to express Our deep gratitude to Prof. Jagruti Solanke, for their patient guidance, enthusiastic encouragement and useful critiques of this research work. We would also like to thank Head of the Department Professor B. T. Deshmukh, for his advice and assistance in keeping our progress on schedule.

We would also like to extend our thanks to the technicians of the laboratory of the Electrical Department of JNEC College for their help in offering us the resources in running the program.

Finally, we wish to thank our parents for their support and encouragement throughout our study.

V. CONCLUSION

This system develops a small amount of electricity generation from the RTV. The RTV is used as a vertical axis turbine and it is not consuming electricity for its functioning. as the output of this system is small but it can power up small loads like lighting load. This output is from one RTV. Industries, godowns rooftop have several RTV connected for ventilation purpose. Interconnection of multiple RTV can give enough amount of electricity. It can serve as one kind of backup or standalone system during power out. And can be used in combination with regular supply to reduce electricity consumption. Design of permanent magnet generator has much scope in the improvement of efficiency of this project. This can be a small effort towards harnessing clean renewable energy.

VI. REFERENCES

- [1] A. Gálvez, M. Lejárraga, J. S. Artal, A. Usón and F. J. Arcega “*Recycling of small electrical machines and its Applications for low cost wind turbines*” Department of Electrical Engineering. E.U.I.T.I., University of Zaragoza, 2014.
- [2] Mobi Mathew, Fajo F Nellissery, Ashok Anand “*Development of a Small Scale Power Generation System using Rooftop Ventilator*” 2016 IEEE Students’ Conference on Electrical, Electronics and Computer Science.
- [3] Maneesh Khandelwal, Pratik Mundle, Darshan pande, Tushar Bang, Dr. Mrs. Madhuri A. Chaudhari, Mr. Sunil Mutha “*Use of RoofTop Ventilator for Electricity Generation*” 2017 International Conference On Smart Technology for Smart Nation.