Implementation of Aerofoil Power Generator on Cellular Base Station for Emergency Backup

Dhanalakshmi.S[1] Prasanth.J[2] Sahana.I[3] Sudha.S[4] Gowtham.S[5]
[1]P.G. Student [2,3,4,5]UG Student
[1,2,3,4,5]Department of Electrical & Electronics Engineering
[1,2,3,4,5]Info Institute of Engineering, Coimbatore-641107, Tamilnadu, India

Abstract— *in this paper we propose a new concept of supplying an alternative power source for the mobile base station in order to supply enormous amount of diesel to the generators. hence hereby we approach a project to replace the diesel generators by implementing the aerofoil power generators on the mobile base station. this consumes renewable energy of wind from nature and supplies necessary amount of power to operate the mobile base station, depending on the power need for the mobile base station during the emergency period. this project also helps in decreasing the effect of pollution such as carbon emission due to the usage of diesel fuels into the atmosphere. hence this project helps in improving the profit by avoiding the expensive amount that are spend for the huge amount of diesel purchasing from the market. this paper will reduce the demand of fue. ls to the next generation.*

Keywords— Wind Blades, Dc Generator, Battery, Boost Converter

I. INTRODUCTION

nowadays mobile phones became a part of each and every people's life in the field of communication. the mobile base station operates mainly with the help of power supplied from electricity board and diesel generators. hence, during any emergency period of power failure from electricity board, the base station is supplied with the help of diesel generators. the diesel generators consume more amount of fuel to operate during the period of emergency; it causes a heavy loss of money to the telecommunication companies for each and every year. thereby installing the wind powered generators on all mobile base station the respected company can achieve a profit of nearly 50% of money. here, we use vertical axis wind turbine for the purpose of continuous power generation. as there is a constant wind pressure above the level (150feet) of the tower rated amount of speed is achieved by the dc generator in an efficient manner. but in horizontal axis wind turbine the required amount of wind pressure is high and it is not achievable throughout the day.

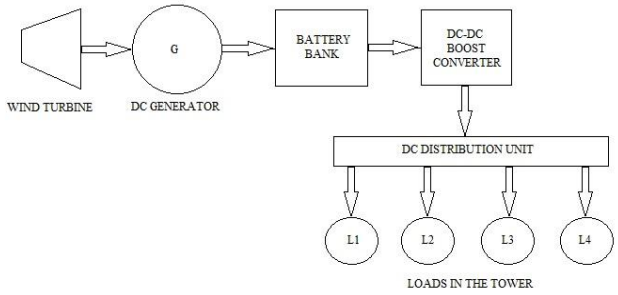

Fig. 1: Block Diagram Of Proposed Method

When the wind blows the turbine blades start to rotate. As the turbine and the generator is connected by the generator, the generator also starts the rotation with 100 revolution per minute. The generator will produce 12V, 3A. The power produce by the generator is stored in the battery bank. Then the power stored in the battery is given to the DC-DC Boost Converter in order to step-up the voltage and current to 24V, 6A. The output of the boost converter is given DC power distribution unit and to the load in the connecting towers.

II. PROJECT DESCRIPTION

in this project we uses four number of blades for wind turbine and it is connected to the shaft of a large pulley wheel on the top of tower. a small sized pulley wheel is connected to the generator's shaft. these two pulleys are connected using a leather belt for free rotation. when a larger pulley rotates 1 revolution the smaller pulley will obtain 12 revolution per minute. now the generator starts to rotate in its rated speed (100rpm) and the output power of (12v) is achieved and stored in battery bank. through the power converters the required amount of power is supplied to the equipment's is by means of a dc distribution unit.a dc generator along with the prime mover of wind turbine is fixed on the top of the tower. the generator power of dc is transferred to the battery bank which is placed on the bottom of the tower which stores the power through out the day. during the period of any emergency like power shut down of the eb supply to the tower equipments, the energy stored in the battery is discharged through the dc to dc boost converters to increase the level of the output voltage and output current for the required level to supply the various loads connected in the platform of the tower which are the major requirements for the successful operation of the telecommunication system by means of a dc power distribution unit.

III. ECONOMICAL DRAWBACK OF EXISTING SYSTEM

The mobile base station operates mainly with the help of electrically supplied from electricity board and diesel generators. Hence during any emergency period of power supply failure from electricity board, the base station is supplied with the help of diesel generators. The diesel generators consume more amount of fuel to be operated during the period of emergency. It causes heavy loss of money for the Telecommunication companies for each and every year. The details of the diesel generated and cost spend by the mobile towers. Diesel consumed per day = 3 liters

Diesel consumed per month	= nearly 10 liters
Diesel consumed per year	= 1200 liters
Cost of diesel per liter	= Rs.47
Cost of diesel per day	= Rs.141
Cost of diesel per month	= Rs.4, 230
Cost of diesel per year	= Rs.50, 760

So, these are the problems occur in existing system. In order to reduce the usage of diesel, reduce the carbon emission and the cost spend by the mobile towers we use renewable energy.

IV. SAVING POTENTIAL FROM PROPOSED SYSTEM

For replacing the usage of diesel generators we operates with the help of renewable energy. This project also helps in decreasing the effect of pollution such as carbon emission due to the usage of diesel fuels into the atmosphere. Hence this project helps in improving the profit by avoiding the expensive amount that are spend for the huge amount of diesel purchasing from the market. The diesel generators are operated with the help of huge amount of fuel for supplying power to the base stations. Hence it causes a huge amount of financial losses for the telecommunication companies which leads to about 300 crores per year. And also the usage of liquid fuels in the market is rapidly increased, which reduces the demand of fuels to the next generations. We must reduce the usage of liquid fuels. The details of power consumed by the mobile towers and the cost is given below,

Power consumed in one hour = 3 units
Power consumed in 3 hours per day= 9 units
Power consumed per month = 270 units
Power consumed per year = 3240 units
Cost of one unit (from 0 to 100W) = Rs.5
Cost of 1 unit (above 100) = Rs.8.05

These are the power consumed in the mobile towers and the cost of the units. So, by using wind energy we can reduce carbon emission and also the cost spending for the diesel.

V. DC-DC BOOST CONVERTER SIMULATION

Here the input supply for boost converter is given by the battery bank. Approximately the value of input voltage is 12V and input current is 3A. Boost converter is used to step-up both voltage and current to satisfy the load in the mobile tower.so the output of the boost converter is approximately 24V and 6A.During ON state the diode acts as a reverse biased and the inductor get charged. The output part is separated. During OFF state the output of the converter get power from the inductor and the capacitor is used to maintain the constant output

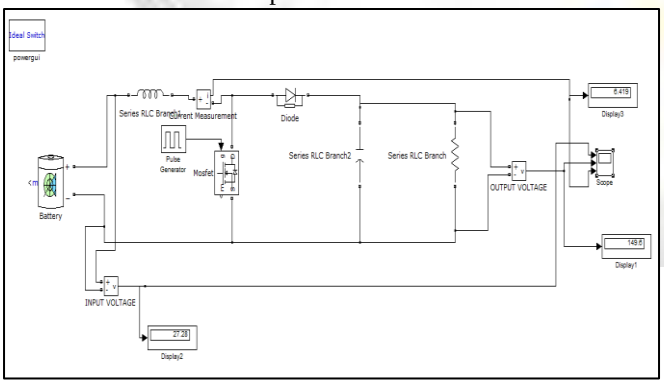

Fig. 2: Dc-Dc Boost Converter Simulation Circuit Diagram

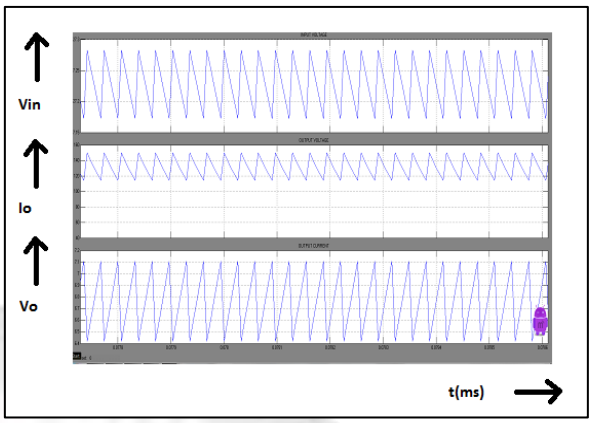

Fig. 3: dc-dc boost converter simulation output

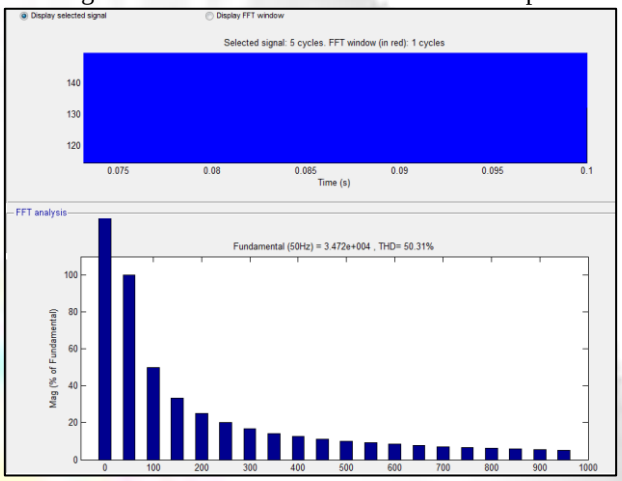

Fig. 4: thd waveform of dc-dc boost converter

In the above diagrams 2, 3, 4 are the circuit diagram, simulation output and thd waveform of a dc to dc boost converter. the simulation is simulated by using matlab. fig 3 shows the simulation of dc to dc boost converter which is used to step up both voltage and current. the battery with voltage 24v and current 3a is connected with the series rlc, diode and mosfet. as mosfet is getting a gate pulse from the pulse generator. finally the input and output voltage and current (vout=48v, iout=6a) is connected to the scope icon in the circuit. fig 4. shows the simulation output for boost converter. after that fig 5. shows the fft analysis and the thd waveform of a boost converter. it can be done by using discrete icon in the circuit diagram

REFERENCE

[1] Hikaru matsumiya, ryosuke ito, masafumi kawakami, daisuke matsushita, makoto iida chuichi arakawa "performance measurement and evaluation of 1-kw small wind turbine" proceedings of ewec 2009

[2] Sedaghat, a., and mirhosseini, m., "aerodynamic design of a 300 kw horizontal axis wind turbine for province of semnan" energy conversion and management, 2012, volume 63, pp.87-94

[3] Erichhau',windturbinefundamentals,technology, application, & economics. 2nd edition, springer publication, germany.

[4] Baku m. Nagai, kazumasa ameku, jitendro nth roy "performance of a 3 kw wind turbine generator with variable pitch control system", applied energy, september 2009, volume 86, issue 9, pp.1774–1782

[5] John f. Hall, dongmei chen "performance of a 100 kw wind turbine with a variable ratio gearbox" renewable energy, august 2012, volume 44, pp. 261–266
[6] Mitchell, m. Nagrial, j. Rizk, "simulation and optimization of renewable energy systems," electrical power and energy systems, vol. 27, pp. 177-188, march 2005.
[7] j. Wang, f.z. Peng, j. Anderson, a. Joseph, r. Buffenbarger, "low cost fuel cell converter system for residential power generation",ieee trans. On power electronics, vol. 19, pp. 1315-1322, sep. 2004.
[8] J. H. Lee, h.s. Bae, b.h. Cho, "resistive control for a photovoltaic battery charging system using a microcontroller", ieee trans. On industrial electronics, vol. 55, pp. 2767-2775, july 2008.
[9] R. D. Middlebrook and s. Cuk, "a general unified approach to modeling switching power converter stages," in ieee power electronics specialists conference records, pp. 18–34, 1976.
[10] M. O. Bilgic and m. Ehsani, "analysis of single flying capacitor converter by the state-space averaging technique," in proc. 1988 ieee int. Symp. Circuits syst. (iscas'88), finland, pp. 1151–1154.