

# Design and Development of Power Generation using Air Exhauster for Industrial Applications

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**Abstract**—This work proposes for Power generation using Attic type (internally braced) air exhauster to generate the power for industrial application. Generally power can be obtained from modified naturally wind driven mills and PV connected sources etc., by using these sources to generate the power installation cost is very high and lot of space also needed, wind mills are created pollution so it's affected for environment. To eliminate these problem designing the attic type air exhauster with AC generator, Regulator , DC-DC converter , Inverter, step up transformer for low power to high power conversion and produce efficient output to the load. In this method AC generator to convert the energy from air exhauster, and it is given to DC-DC converter (rectifier, Boost converter). Boost converter used to step up the voltage, finally inverter used to invert the voltage and generate the power for utilization during Application based on our requirement. A novel Pulse Width-Modulated (PWM) control scheme the low and high frequency variations can also be achieved by this method. This scheme for the AC/AC converter reduces the losses, cost, and pollution. The proposed system is validated under experimental setup and generating the voltage upto 40W. The proposed system is validated with the Matlab simulation for experimental setup for rectifier, boost converter, and inverter its connected to the load. And simulation results are verified with the same output for experimental setup.

**Keywords**—AC Converter, Rectifier, Boost converter, Inverter, Step-up transformer

## I. INTRODUCTION

Alternate energy sources are getting increased attention as power conversion solutions for improving the efficiency, reducing the complexity, ease of operation, quality of operation, and energy saving features in industrial applications like textile industry, machine manufacturing industries and distribution generation systems with renewable and alternate energy sources, power conversion modules of fuel cells, battery based Uninterruptible Power Supply (UPS) system galvanic isolation need to protect the voltage and current in terms of leakage condition. Renewable energy sources are energy supplies that are refilled by natural processes at least as fast as we use them .We can use the sun directly (as in solar heating systems) or indirectly (as in hydroelectric power, wind power, and power from biomass fuels). Renewable energy supplies can become exhausted if we use them faster than they become replenished: most of England's forests were cut down for fuel before the English started using coal. If used wisely, however, renewable energy supplies can last forever.

## II. ALTERNATE ENERGY SOURCES SURVEY

SOURCES	GW
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Coal	145.3
Hydro	40.5
Gas	21.8
Wind	21.1
Nuclear	4.8
Solar	2.6
Other	7.9

Table1: Energy generations using various resources

### A. India's Annual Wind Energy Capacity

YEAR	MW
2005	1100
2006	1700
2007	1710
2008	1690
2009	1500
2010	1600
2011	2320
2012	3200
2013	1700
2014	2000

Table2: Energy generation in wind

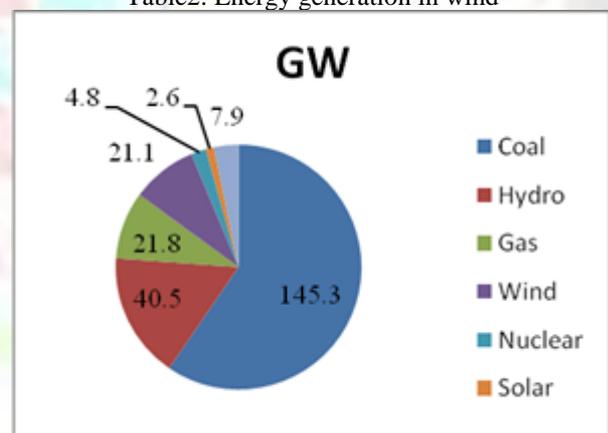


Fig. 1: % of Energy generations using various Resources

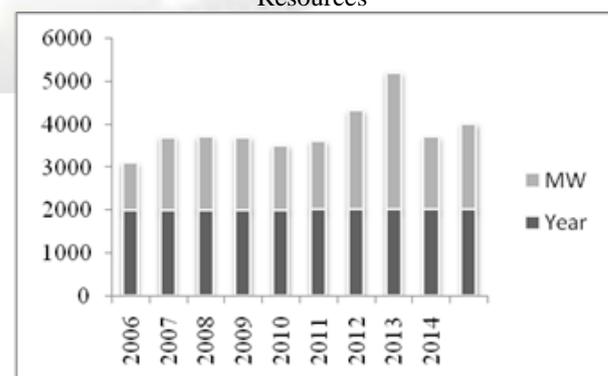
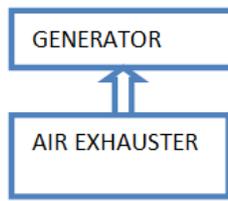


Fig. 2: % of Energy generations using various Resources



III. BLOCK DIAGRAM OF PROPOSED METHOD

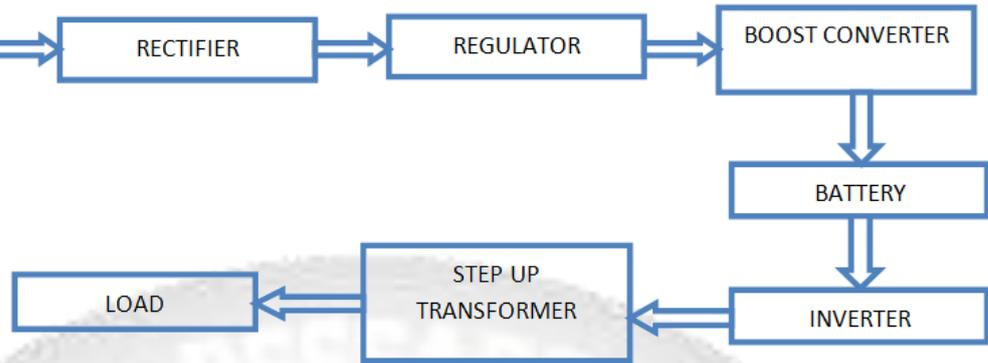


Fig.3: Block diagram of proposed method

IV. SYSTEM CONFIGURATION

The attic type (internally braced) air exhauster can be considered only for alternate energy source and it used for the generating the energy for industrial application. Air exhauster which reduces the conversion complexity by directly placing the generator. This proposed control scheme in order to lower switching frequency in the converter stage. When compared with conventional methods this air exhauster has better efficiency and better output achieve.

V. PROJECT DESCRIPTION

The aim of this project is to generate power using air exhauster. AC supply is drawn from the air exhauster using

ac generator. Supply from the AC generator is fed into rectifier and then converted into DC. The obtained DC voltage is maintained constant with the help of the voltage regulator. The constant DC supply is then boosted using boost converter and it is stored in a battery. The boosted voltage from the battery is converted into AC using inverter. The converted AC supply is stepped up by using step up transformer and it is given to the load.

VI. CONVERTERS AND INVERTERS SIMULATION

A. Single Phase Rectifier:

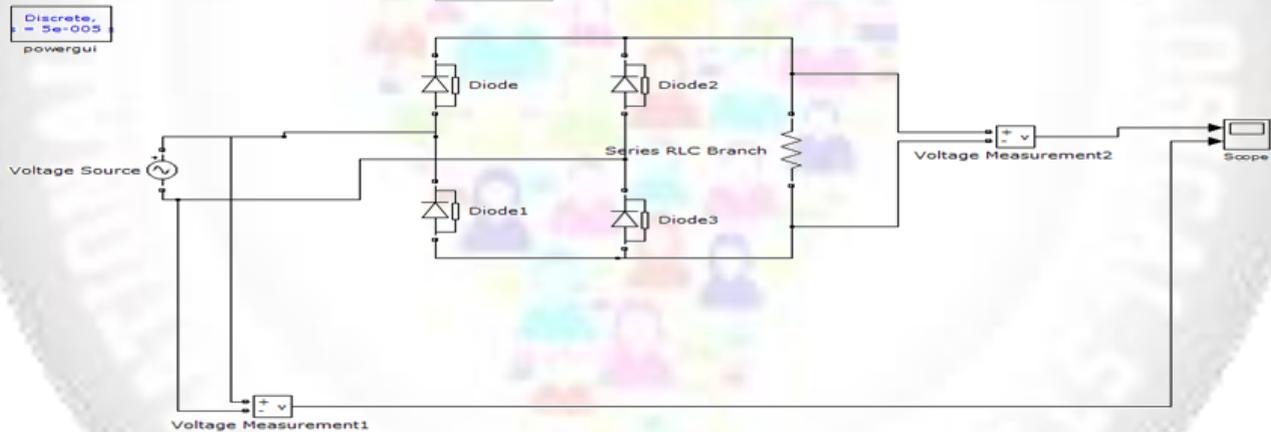


Fig.4: Simulation for Rectifier

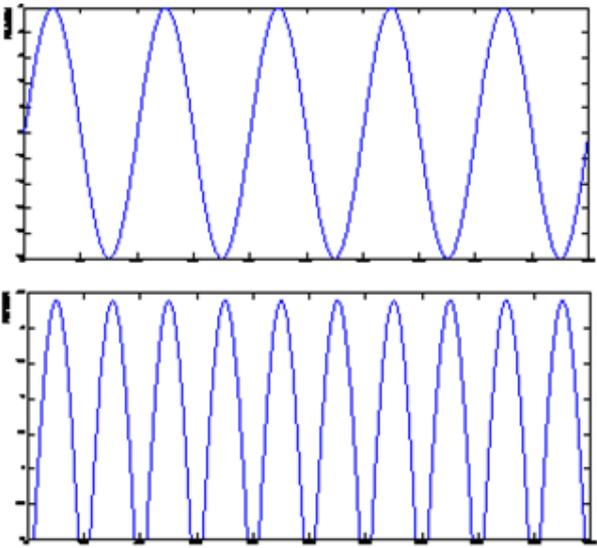


Fig.5: Simulation output for Rectifier

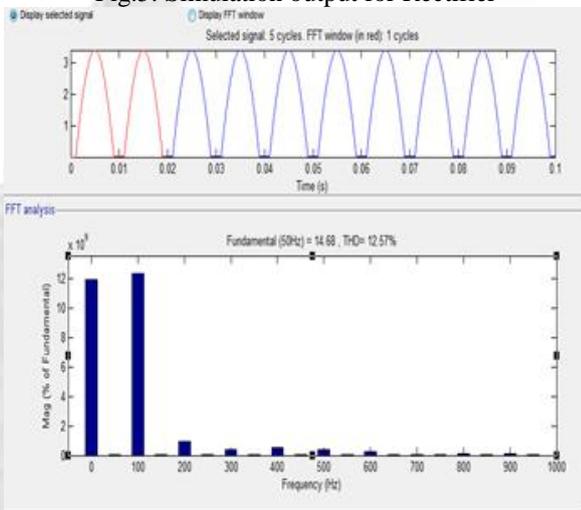


Fig. 6: THD waveform for Rectifier

In the above diagrams Fig 3, 4 and 5 are the circuit diagram, simulation output and THD waveform of a single phase rectifier respectively. The simulation is simulated by using MATLAB. In fig 3. A whole simulation will be kept under a discrete mode because to occur an instant output in a discrete manner. An input AC voltage ( $V_{in}=5V$ ) is connected with the parallel diodes and series RLC. We obtain rectified DC output voltage waveform from voltage measurement block. Current measurement is obtained using diodes. Another block of voltage measurement is directly connected to the input voltage source which is used to exhibit the input waveform in the simulation. Finally, fig 4.shows the simulation result using scope icon in the circuit which is connected by the voltage measurement icon. After that fig 5 will shows the FFT analysis and the THD waveform of a single phase rectifier. It can be done by using discrete icon in the circuit diagram.

SIMULATION PARAMETERS	
Input voltage	5V
Output voltage	5 V
Load resistance	10 ohm
Frequency	50Hz
Snapper resistance in diode	500 ohm
Snapper capacitance in diode	250e-9

Table 3: Parameters of rectifier

## VII. SINGLE PHASE INVERTER

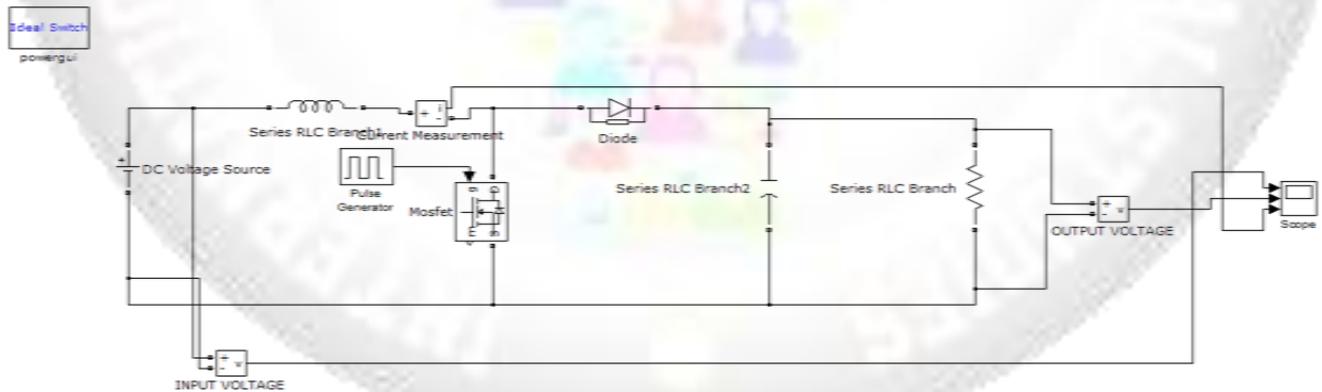


Fig.7: Simulation for Boost converter

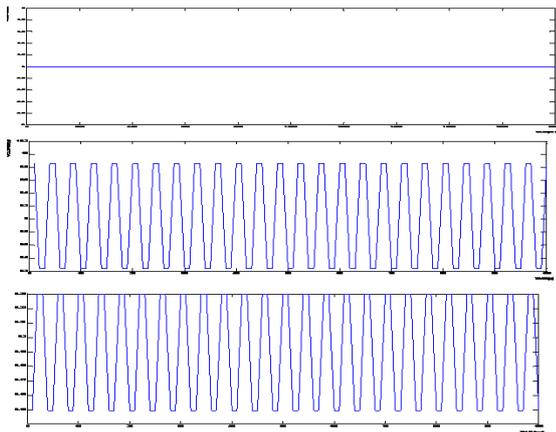


Fig.8: Simulation output for Boost converter

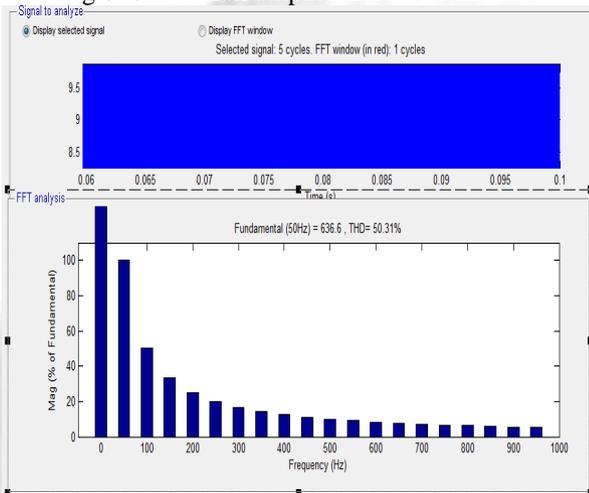


Fig.9: THD waveform for Boost converter

In the above diagrams Fig 6, 7 and 8 are the circuit diagram, simulation output and THD waveform of a single phase rectifier respectively. The simulation is simulated by using MATLAB. In fig 6. A whole simulation will be kept under a discrete mode because to occur an instant output in a discrete manner. An input voltage ( $V_{in} = 5V$ ) is connected with the series RLC, diodes and MOSFET. Ass MOSFET is getting a gate pulse from the pulse generator. Finally the input and output voltage ( $V_{in} \sim 10V$ ) is connected to the scope icon in the circuit. Fig 7. Shows the simulation output for boost converter. After that fig 8. show the FFT analysis and the THD waveform of a single phase rectifier. It can be done by using discrete icon in the circuit diagram.

SIMULATION PARAMETERS	
Input voltage	5V
Output voltage	10-12 V
inductance	1e-3
Filter capacitance	1e-6
Load resistance	100 ohm
Pulse generator (period)	1/31e3
phase width	50
phase delay	0

Table 4: Parameters of boost converter

### VIII. SINGLE PHASE INVERTER

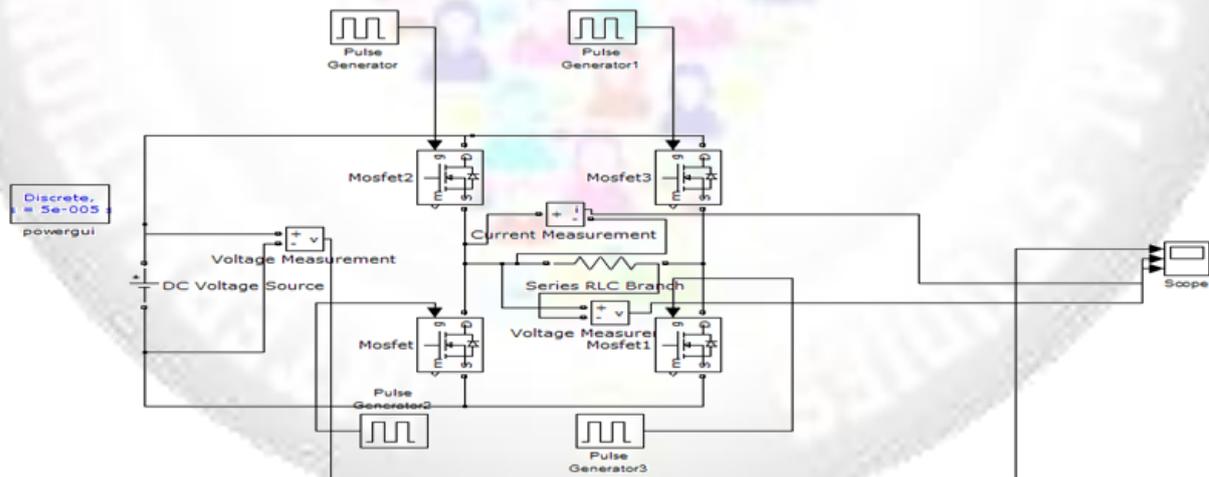


Fig.10: Simulation for single phase inverter

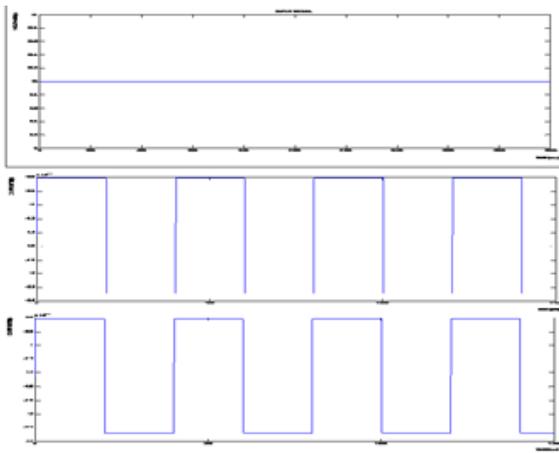


Fig. 11: Output wave form for single phase inverter

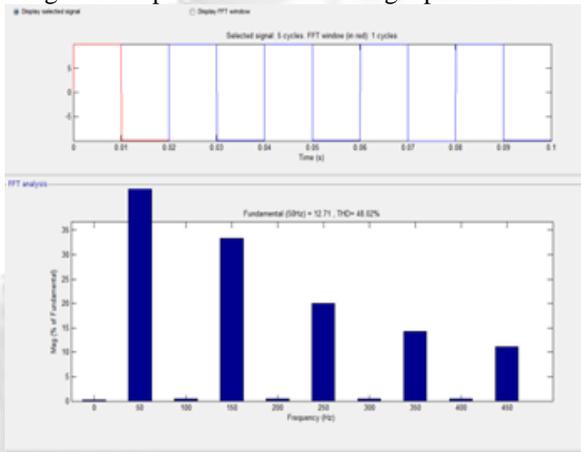


Fig. 12: THD wave form for single phase inverter

In the above diagrams Fig 9, 10 and 11 are the circuit diagram, simulation output and THD waveform of a single phase inverter respectively. It shows that the simulation diagram of proposed method for boost converter can be obtained by using the blocks of DC voltage source, pulse generator, mosfet switch, diode, load resistance and voltage measurement. In Inverter DC input voltage converted AC output voltage by varying the parameters of pulse generator time period and phase width and load resistance values time period on and off values are obtained. The input voltage of 10V DC converted to 10 V DC time period on and time period off of output signal and the output current 5mA.

SIMULATION PARAMETERS	
Input voltage	10V
Output voltage	10 V
Load resistance	100 ohm
Pulse generator (period)	0.02
phase width	50
phase delay	0
Snupper resistance	500 ohm
Snupper capacitance	250e-9

#### IX. CONCLUSION

A design and development of power generation using air exhauster for industrial applications in the converter part is simulated using MATLAB software. This method is good alternative for comparing the other alternative sources to

implement the attic type (internally braced) is proposed and eliminates the existing method and generates the voltage upto 40w. In single phase rectifier input signal of 5 v AC, 50Hz frequency, the proposed method will provide the output frequency about 3.5 v DC. In boost converter input voltage of 5V DC converted to 10 V DC of output signal and the output current 0.23A. in inverter input voltage of 10V DC converted to 10 V DC time period on and time period off of output signal and the output current 5mA. The proposed method is validated under Matlab simulation and the output voltage upto 40W.

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