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# ELECTRICITY GENERATION FROM AIR CONDITIONING EXHAUST AND INDUSTRIAL EXHAUST

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**ABSTRACT—**

As global energy increases and traditional sources such as fossil fuels are demanded, there is a growing change towards renewable energy. Wind energy is a promising option, but it depends on natural air, which can be inconsistent. The project presents an innovative solution by exploiting wind energy from the exit air produced by industrial systems and air conditioners. By installing small, skilled wind turbines near these exit outlets, the system captures and changes the waste airflow into electricity. The power generated is stored in the battery and can be converted to various uses. Compact and reliable, this setup is ideal for urban and industrial areas where natural air can be limited. It provides a cost -effective, environmentally friendly way to produce clean energy, which highlights the ability of renewable solutions on a subtle scale for a permanent future.

**Keywords**— wind turbine, Wind energy, Renewable energy, Exit air utilization

## INTRODUCTION

The demand for economic growth and energy is closely associated with developed countries, historically the world's energy is consumed. However, due to rapid population growth, industrialization, and increasing standard of living, developing countries now expect most of the future energy demand. Outlook for Energy: A View to 2040 (2018), global energy consumption can double by 2040. Despite this, the world is highly dependent on non-renewable sources such as coal, oil and natural gas. These fuels, while economically important, contribute significantly to climate change and are becoming unstable due to lack and volatility in value. To address these issues, renewable energy sources such as wind, solar, hydro, and geodetic have a strong global change. These sources are environmentally friendly and have the ability to meet or increase global energy needs. However, challenges such as high cost, storage boundaries, infrastructure needs and inconsistent availability continue to adopt widely. The project is particularly focused on wind energy, especially the low capacity of man -made air produced by industrial and air conditioning exhaust systems. By installing compact turbines near these exits, the system constantly catches airflow and converts it into electricity. This innovative approach promotes clean energy production, especially in urban areas, and supporting the broader goal of reducing fossil fuel dependence by recovering energy from waste.

## THE OBJECTIVES OF THIS RESEARCH ARE

**A.** Determination of exit air energy recovery turbine generator configuration:
This will include experimental analysis on the performance of both wind turbine and exit air system to identify the optimal configuration for efficient energy recovery.

**B.** Experimental analysis of Defuser as Power Augmentation device:
This objective will detect the use of a defuser as an accessory to increase the power generation capabilities of the exhaust air energy recovery turbine generators. The effects of the visitor on wind speed and turbine efficiency will be evaluated.

**C.** Energy estimate of exit air energy recovery turbine generator:
This objective will focus on estimating the possible energy production of the system by analyzing the energy generated by wind turbines under various exit air conditions.

***The main objective of the project:***

The primary objective of this project is to prove that the airflow generated by the exit air system can be transformed into effectively valuable energy using wind turbine generators. Furthermore, it will demonstrate that this process of energy recovery does not adversely affect the performance of the air system, thus promoting permanent energy use without compromising operating efficiency.Abbreviations and Acronyms

## Literature Survey

Wind energy is a shape of renewable energy that harnesses the kinetic power of shifting air hundreds. Wind is generated due to differential heating of the Earth's floor through the sun, mixed with the Earth's rotation and surface irregularities (Bhatia, 2014). This kinetic electricity, when captured via the blades of a wind turbine, is converted into mechanical electricity and sooner or later into electrical strength using generators. According to Mathew (2006), the performance of this conversion is by and large ruled via the interaction among the wind stream and the rotor blades of the turbine. Optimizing blade design, material, and orientation is therefore vital to *maximize* the energy conversion efficiency. Globally, wind electricity has visible exponential growth. As according to the Global Wind Energy Report (2015), the entire established wind energy capability reached about 370 GW by using the *quilt* of 2014, marking a 16% boom in comparison to 2013. This boom displays the increasing shift in the direction of easy power sources amid concerns over fossil fuel depletion and environmental impact. Historically, wind electricity is one of the oldest acknowledged strength resources. Its application dates returned to ancient civilizations — round 200 B.C., Persians used windmills for grinding grains. By the 18th and nineteenth centuries, rudimentary wind turbines were being explored for strength era inside the United States and Denmark, laying the inspiration for cutting-edge wind electricity technology.

## GENERAL SYSTEM AND SYSTEM WORK PRINCIPLE

**A. Exhaust air wind energy exploitation:**

Exhaust fans used in large industries or commercial establishments have the ability to generate electrical energy. The strong, consistent air produced by these fans can be directed towards a small wind turbine or windmill that is strategically placed in front of the exhaust fan. The Wind thrust generated by the exhaust fan runs the wind turbine, which converts wind energy into mechanical energy.

**B. Power generation:**

As the wind turbine rotates, it generates electrical energy through a connected generator. This electricity generated can then be stored in a storage unit, such as battery, with different -capacity according to the energy production level of wind turbines. The storage unit stores this energy for future use.

**C. energy conversion:**

Once the energy is stored in the storage unit, it is converted from direct current (DC) to the current (AC) using an inverter. This AC energy can then be supplied to load (facilitating or system that requires electricity).Some Common Mistakes

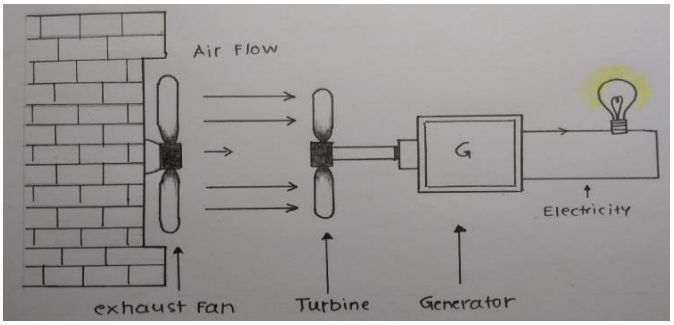



**Fig 5.1: Working Principles of Proposed System**

## DESIGN DESCRIPTION AND METHODOLOGY

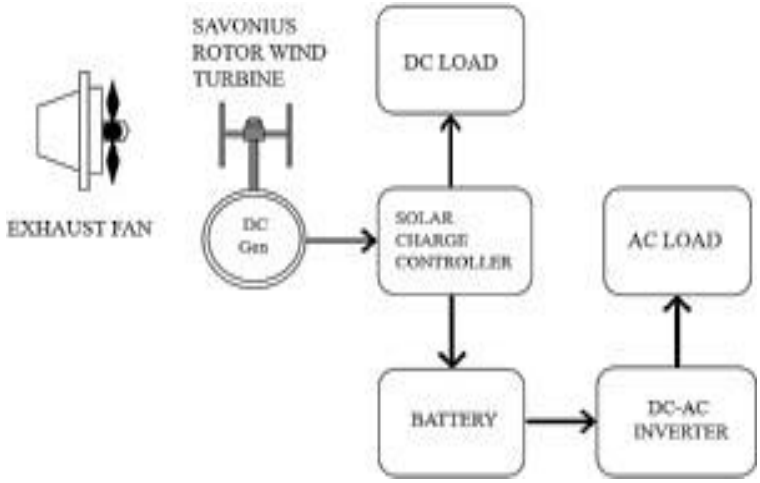
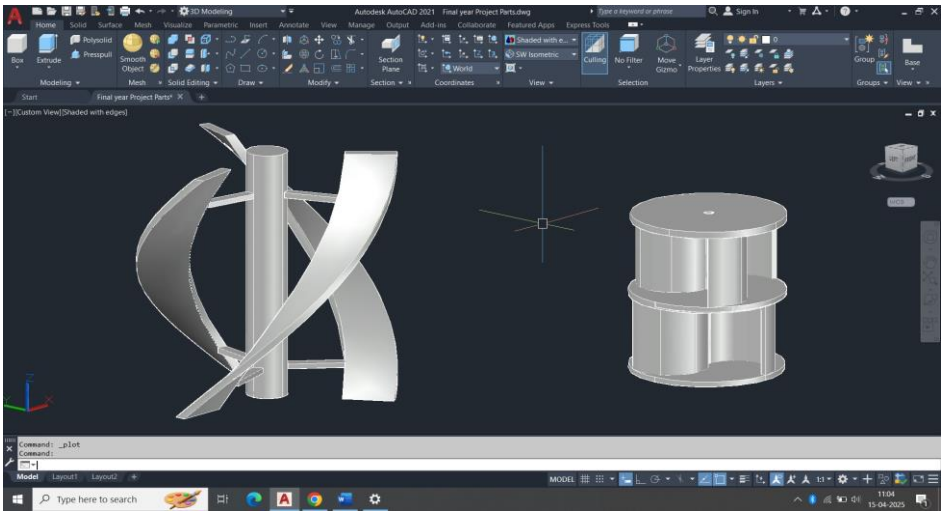



**Fig 4.1: Design Framework of proposed system**

## DIVERSITY OF DIVERSITY OF WIND TURBINE

Exit air energy recovery turbine generators can be installed in many variations. For a large size of exhaust air outlets, more than one turbine can be installed to use discharge air. However, it depends on the availability of space, structural power and most importantly, it should not negatively affect the performance of the original exhaust air system. A graph within a graph is an "inset", not an "insert". The word alternatively is preferred to the word "alternately" (unless you really mean something that alternates).



## ASSEMBLY AND COMPONENTS USED IN THIS PROJECT

**Fig 7.1: Assembly of component**

**a) AIR-CONDITIONER OUTDOOR UNIT EXIT FAN: 230V, 1200RPM**

- Cooling capacity: 3 tons (36,000 btu/hr.)
- Fan Fan: Propeller (Axial) Fan
- Fan Vyasa: Usually about 18-24 inches (450–600 mm)
- Fan Speed: 800 - 1200 rpm (different by brand/model)
- Air flow rate: approx. 3000 - 4500 cfm (cubic feet per minute)
- Motor Power: 1/6 to 1/4 hp (horsepower), usually 150W - 200W
- Motor Voltage: 220–240V AC, single phase frequency: 50/60 Hz
- Fan Blade Material: Aluminum or Plastic

**b) DYNAMO GENERATOR: 12V, DC, 0.9AMPER**

The generator is a machine that converts mechanical energy into electrical energy. It works based on the principle of Faraday law of electromagnetic induction. The Pharides law states that the EMF is induced whenever a conductor is placed in a separate magnetic field and this induced EMF is equal to the rate of change of flux flax linkage. This EMF can be generated when there is a relative location or relative time variation between the conductor and the magnetic field.

**c) BATTERY:**

12V, 0.39amp A 12-volt motorcycle battery is made up of a plastic case with six cells. Each cell is made up of a set of positive and negative plates that are immersed in a thin sulfuric acid solution, known as electrolyte, and each cell has a voltage of about 2.1 volts when fully charged. (Fig 4.3: Battery)

**d) CHARGE CONTROLLER:**

(Repeb Boost Converter) Battery Voltage - 12V/24V Auto ADPT Max Input - 41V Operating temperature - -35 ~+60 c size / weight - 133*70 × 35 mm / 150g (Fig 4.4: Charge Controller)

**e) INVERTER:**

Inverter is an important part of any electric system that requires electricity to any AC (optional current) load. AC power they are the type of election

## CONCLUSION

It has been observed that the air from exit can serve as a very good source of electricity. The wind speed is sometimes higher than the speed of natural air and hence can generate even more electric power than natural air. As previously discussed, the air from the exhaust fan may be dispersed after some time, there should be some types of directors/connectors who will directly guide the air to wind turbines directly to the wind turbine without achieving the average speed of the air as the air velocity is the most important factor in the system. The air wasted from the exhaust fan can be used effectively. If proper implementation is done then effectively it can be used to generate power.

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