

POLLUTION CONTROLLER USING VERTICAL AXIS WIND TURBINES ON ROAD DIVIDERS

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Abstract: Air is a very important aspect of our lives. But today the quality of air is deteriorating with the passage of time. Nowadays due to rapid increase in vehicles in cities, air pollution has become a critical issue. It has become a national issue for a number of countries. Air or wind is also a very important source of energy. Therefore it is essential to use the energy for generation of power and also the contaminated air should be properly treated because we cannot intake toxic substances. This idea mainly concentrates on completely utilizing the turbulence of air on road for harnessing energy and utilizing it to treat the air which is contaminated by vehicular emissions.

Keywords: Voltage sensor, Regulated power supply, Arduino UNO, Relay, Exhaust fan, HEPA filter, Vertical axis wind turbine.

I. INTRODUCTION

Air pollution is a mixture of solid particles and gases in the air. Most air pollution comes from energy use and production. Today, pollution of our environment is as important as many other important problems faced by our country. We are in a situation where, even a person who does not smoke is suffering from severe respiratory disorders. The main aim of this idea is to improve the quality of air in metropolitan cities where the air is polluted due to high gas emissions due to large number of vehicles. This is a simple and effective technique to bring down the pollution rates by using some of the properties like density of air, etc. To strive towards an eco-friendly system, the pollution control is set up with a vertical axis wind turbine, which rotates due to the relative motion of wind caused by movement of vehicles on roads. So primarily we have to look out for a device to treat the emitted air properly. We cannot completely purify the air and let it out but we can surely control the serious health hazards caused by highly polluted air. So the idea is not only to make a city into a smart city, but also a better place to live and control the health hazards caused due to contaminated air.

II. METHODOLOGY

This project mainly works in two parts. The first step is the energy generation and next is the utilization of harnessed energy. Figure I shows the block diagram of the proposed prototype and the manner in which the working of the idea is carried out. It also signifies the way in which the connections should be carried out.

Firstly we have a vertical axis wind turbine which is set up on the dividers separating the roads. The turbine is driven by the turbulence of air created by the movement of vehicles on roads. Availability of air in both the directions is an added advantage in this project. The turbine blades and the shaft materials are made up of aluminium sheets. The turbine is then coupled with a dc motor. It is a 12v brushless dc motor which is powered by pulse width modulated dc voltage. The motor is then connected to the battery to store the generated energy. Meanwhile connections are also given to display devices. Firstly it is connected to a voltage sensor module which measures the generated voltage. The output of the voltage sensor is coupled with a microcontroller based Arduino UNO device. The Arduino takes the input from the voltage sensor and converts the data received. The converted data is processed in such a way so as to display it on the LCD display board. The display device used here is a 16x2 liquid crystal display. The system is also provided with a RPS (Regulated Power Supply) unit. The main function of the RPS is to distribute the energy stored in the battery for different energy requirements in the circuit.

BLOCK DIAGRAM:

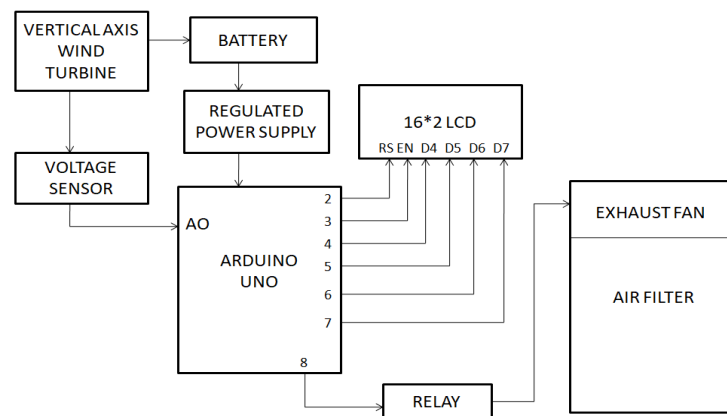


Figure I – Block Diagram

Next step is the utilization of energy in the battery to treat the polluted air. So the main component in this step is a air filter. The most suited kind of air filter for this project is the HEPA(High Efficiency Particulate Arrestor) filter. HEPA filter is a very rare kind of filter which filters pollutants of various particle sizes including nano particles. A filter paper is wound around the air filter in order to eliminate solid particles in air. The filter preferred here is a cylindrical shaped filter which is hollow inside and has opening at the top. A exhaust fan is fixed at the top of the filter. Now the exhaust fan sucks the air through the filter which means the contaminated air is passing through the layers of filter paper and HEPA filters. It indicates that majority of pollutants in the air are eliminated. The treated air is left out to the atmosphere. The energy for the exhaust fan is supplied from the battery. The current is not directly supplied to the fan but through means of a relay. The relay makes sure that the exhaust fan is switched on only when the wind turbine is rotating. It means that when there are no vehicles on roads and there no rotation of the turbine, the exhaust fan is switched off. This is very important because any kind of energy should not be wasted.

The wind turbine generates enough energy for the exhaust fan to run continuously. As of the practical testing, even when the battery was not charged it took few seconds to charge the battery and work in the way accordingly. Figure II and III show the vertical axis wind turbine and filter respectively. So this is a simple and effective approach towards dealing with modern day vehicular population.



Figure II – Vertical Axis Wind Turbine



Figure III – HEPA filter

III. CONCLUSION

The advantages of the proposed idea are given below:

- All the wasted wind energy is used for a useful purpose.
- Air is treated where it is polluted.
- Less number of software parts which facilitates easy repairs.
- If solar energy generation is coupled with this system it will generate large amount of power which can be used for different purposes.

The results obtained from the idea are :

- Better air quality in cities which is the need of the hour.
- Any kind of vehicle movement will generate energy which results in less drawbacks in generating energy.
- No wastage of energy of any form by using different techniques.
- Less cost of maintainance as even the air filter can be reused after treating then at air labs.

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