



CHARACTERIZATION AND STUDY ON REDUCING THE POLLUTION FROM SURROUNDING ATMOSPHERE IN TRAFFIC CIRCLES.

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Abstract: This paper is about the life saving system by reducing the harmful gases in the atmosphere near or surrounding the traffic signals and circles. We have seen the exhaust fan in the kitchen and in the factories to remove the odour smell, unclean air, etc. from the specified space, the similar application can be used on Traffic signal where all engines are in idle mode or generally in first or second gear. This causes more fuel consumption on signals, and the harmful gases released in atmosphere are like Particulate Matter (PM), Greenhouse gases, Carbon Monoxides(CO), Nitrogen oxides(NO_x), Sulphur dioxides(SO₂) etc. which are harmful to nearby Human Beings and Animals too. To overcome this situation and to think out of the box on this problem we have come up with an idea of implementing such device which can suck the nearby impure and unclean air from ground level and leave at a certain height of 70 ft. to prevent these impure air from inhaling by living beings.

KEYWORDS: Exhaust Fan, Pollution, Traffic Circles, Ventilation.

I. INTRODUCTION

Health, the health of a living things has been an important concern to all of us nowadays. Because of that, having lots of biological pollutants and dust mite in the living place may cause a serious threat to our health. Thus, the improvement of the air quality is an increasing and a major concern to many people.

We all know that global warming is a severe issue that is happening in the world right now, which eventually will bring all unwanted natural disasters due to the pollution and overheating in the atmosphere and dilapidates the ability of earth to deal with these situations accordingly and to save the world, a few methods are being suggested by ecologists. Energy saving, one of the most effective and most commonly applied by the industries, are used throughout the world in order to avoid the earth from pollution and overheating. As a result, the concept of energy saving is being applied in the project to reduce the pollution thus saving earth as well.

We have seen the exhaust fan in the kitchen and in the factories to remove the odour smell, unclean air, etc. from the specified space or from an enclosed area. Typically Ventilation is the intentional introduction of outdoor air into a space or drawing air out of building and thereby cause equal ventilation flow into a building. Ventilation is mainly used to control air quality by diluting and displacing indoor pollutants; it can also be used to control temperature, humidity, and air motion to benefit thermal comfort, satisfaction with other aspects of indoor environment, or other objectives.

Mechanical ventilation is the intentional fan driven flow of outdoor air into a building. Mechanical ventilation systems may include supply fans (which push outdoor air into a building), exhaust fans (which draw air out of building and thereby cause equal ventilation flow into a building), or a combination of both. Mechanical ventilation is often provided by equipment that is also used to heat and cool a space.

A fan is a powered machine used to create flow within a fluid, typically a gas such as air. A fan consists of a rotating arrangement of vanes or blades which act on the air. The rotating assembly of blades and hub is known as an impeller, rotor, or runner. Usually, it is contained within some form of housing or case. This increases in safety by preventing objects from contacting the fan blades directly. Most fans are now powered by electric motors.

From the above all information it can be clearly seen that ventilation is only used for the ventilating a specified space or an enclosed space and no any research, study or theory is done on any external ventilation or on an open space ventilation. So to think on the problem statements arising on pollution we have come up with an idea of implementing such device to purify and maintaining the fresh air quality near traffic signals and on roads and surrounding.

II. LITERATURE REVIEW

Teitel and Tanny (1999) [1] worked on the response of air temperature and humidity ratio inside the greenhouse to the opening of roof vents. Their objective was to predict the behavior of those variables within a period relatively short after roof windows were opened, developing a model and validating it against experimental data in a full-scale greenhouse. They found that both temperature difference and humidity ratio decay under an exponential relationship with respect to time, whose extinction coefficient depends strongly on wind speed that not only induces to reach the steady state in a shorter time, but also reduces the value of this state.

Pedro Romero [2] their report summarizes the elements considered as foundations to comprehend the phenomena involved in natural ventilation: processes and variables analyzed, main methods applied, instruments used, and results found. This literature review had as an objective to introduce me into the development of recent research on natural ventilation.

Brendon R. Barnes [3] stated that Indoor air pollution caused by the indoor burning of biomass fuels has been associated with increased risk of acute respiratory infections among children less than five years old in developing countries. Enough evidence of this association exists to support the design, implementation and evaluation of interventions to reduce child exposure to indoor air pollution. This paper reviews the published literature on three technical intervention options: access to cleaner burning fuels, improved cook stoves and modification to housing characteristics.

Harish M. [4] his Paper has made an attempt to study on urban air pollution in Bangalore city by emission of gases by vehicles which emit from them. The present day environment crisis demands a change in attitude, which initiatives can be taken to rescue environment from destruction in the city of Bangalore. But the urban areas have a big share in the present day environmental problems from the automobiles throughout the world. This will finally focus on the attempt on the effects due to increase in the vehicle ratio in the city. Based on the facts and data obtained, the scenarios regarding future vehicle growth and their impact for travel is discussed to overcome emissions problems. The main objective is based on the emission of vehicles and their problems. In future vehicle-based emissions testing should be conducted for at least once in three months in Bangalore to gain a more accurate picture of the emissions that Occur from the specific vehicles in this city.

VanOsdell, D. W. [5] their report gives us results of a literature review, conducted to survey and summarize recent and ongoing engineering research into building ventilation, air exchange rate, pollutant distribution and dispersion, and other effects of heating, ventilation, and air-conditioning (HVAC) systems on indoor air quality (IAQ). He concerns of the ventilation community and technical questions that remain to be solved were identified, as were a number of research opportunities.

Lili Tan and James A. Love [6] has proposed paper on Earth-air heat exchange (EAHE) systems offering the possibility of reducing use of non-renewable energy for heating ventilation air in cold climates. The number of installations of large diameter (greater than 900 mm) EAHE systems reported for cold climates is small. Even less has been reported on their heating performance, but the available information suggests that further rigorous assessment is warranted to determine whether the reported better than expected temperature rise is supported and, if so, the reasons for this. Another concern is the possibility of long-term heat depletion in the surrounding soil, which would affect performance. Only a couple of short-term experimental studies of ground temperature effects of heating with EAHE were found for cool climates.

Bourlad et al (1996) [7] measured various components of the air exchange rate at the level of vent opening, analyzed them along the opening surface, and compared them with the results obtained from tracer gases techniques. Results are presented as distributions of the components (wind velocity and temperature difference, normalized) along a 32-m roof window of a two span greenhouse, and used to predict the ventilation rate. The technique applied in this experiment allows separating the mean and turbulent components of the variables. Additional useful information provided is that wind effect varies inversely to the surface of the experimental greenhouse, being the smallest for a "quasi-infinite greenhouse".

Andy Shapiro, David Cawley, Jeremy King [8] they have done study on Utility sponsored residential new construction programs in Vermont have provided incentives to encourage builders to install exhaust only ventilation (EOV) systems. One utility program has specified the installation of passive air vents as part of the EOV system. This study was undertaken in order to understand the basic air flow performance of these EOV systems. The purpose of the field study was to better understand the air flow performance of EOV systems in new single family homes. The study was contracted in June 1998 by The Vermont Department of Public Service and a group of seven utilities that offered incentives for EOV systems in residential new construction programs.

Aditya Kumar, Sushanta Tripathy [9] have stated their Study of Vehicular Pollution and its Mitigation Measures. The pollution from motor vehicles can be minimized by using new as well as innovative technology, alternate fuels and government policies. These methods need to be used in a proper way to improve the condition of the environment significantly. The present study helps the automobile manufacturers for a better sustainable environment.

Shrivastava R. K., Saxena Neeta, Gautam Geeta [10] have contributed on Rapid urbanization and growth of motor vehicles impose a serious effect on human life and its environment in recent years. Most of the cities of India are being suffered by extremely high level of urban air pollution particularly in the form of CO, SO₂, NO₂, PM (Particulate Matter) and RSPM (Respirable Suspended Particulate Matter). Transport sectors contributes a major share to environmental pollution (around 70%). The present study is a review of an assessment model for emitted pollutants and effective strategies to reduce air pollution due to road transport.

B.P.S. Rao, N. Kumar, V. A. Mhaisalkar [11] have done research on Air quality Index that can give clear view about ambient air and critical pollutant mainly responsible for the quality of air. The AQIs were calculated according to CPCB break point concentration. The AQI study reveals that particulate matter (mainly PM₁₀) was mainly responsible for maximum times in the residential site NEERI, Nagpur. These also have identified that PM₁₀ as the dominant pollutant in the index value (pipalatkarkar et. al. 2012). Particulate Matter is causing serious worldwide public health problem for residents because of their synergetic action. We have to look for

appropriate pollution control and management plans like plantation and green belt etc. for the betterment of the civic life. The use of this tool in decision making for development.

III. DESIGN AND DEVELOPMENT

The general use of an exhaust fan by the people is simply act as a ventilation system which ventilates the air in an area. But often there are things which are important and being neglected by the public, is health. Engine often produces particles of smoke, grease and combusted gasses which are not healthy to breathe in and is environmental pollutants. These exhaust fan are used to remove these pollutants from the air in a specific area.

The device consists of fan, fan duct, solar panel, control panel system, chimney, lights, motor, etc. An external DC motor will drive the fan. The reason why an external DC motor is used, because it is able to make the exhaust fan to have the ability of air exhausting and illumination. It also helps to reduce the noise and power consumption of the exhaust fan efficiently. So the proposed smart system is not only energy saving but also environmentally eco-friendly. The proposed smart system shows that not only does it maintain the air quality but it also improve the energy efficiency.

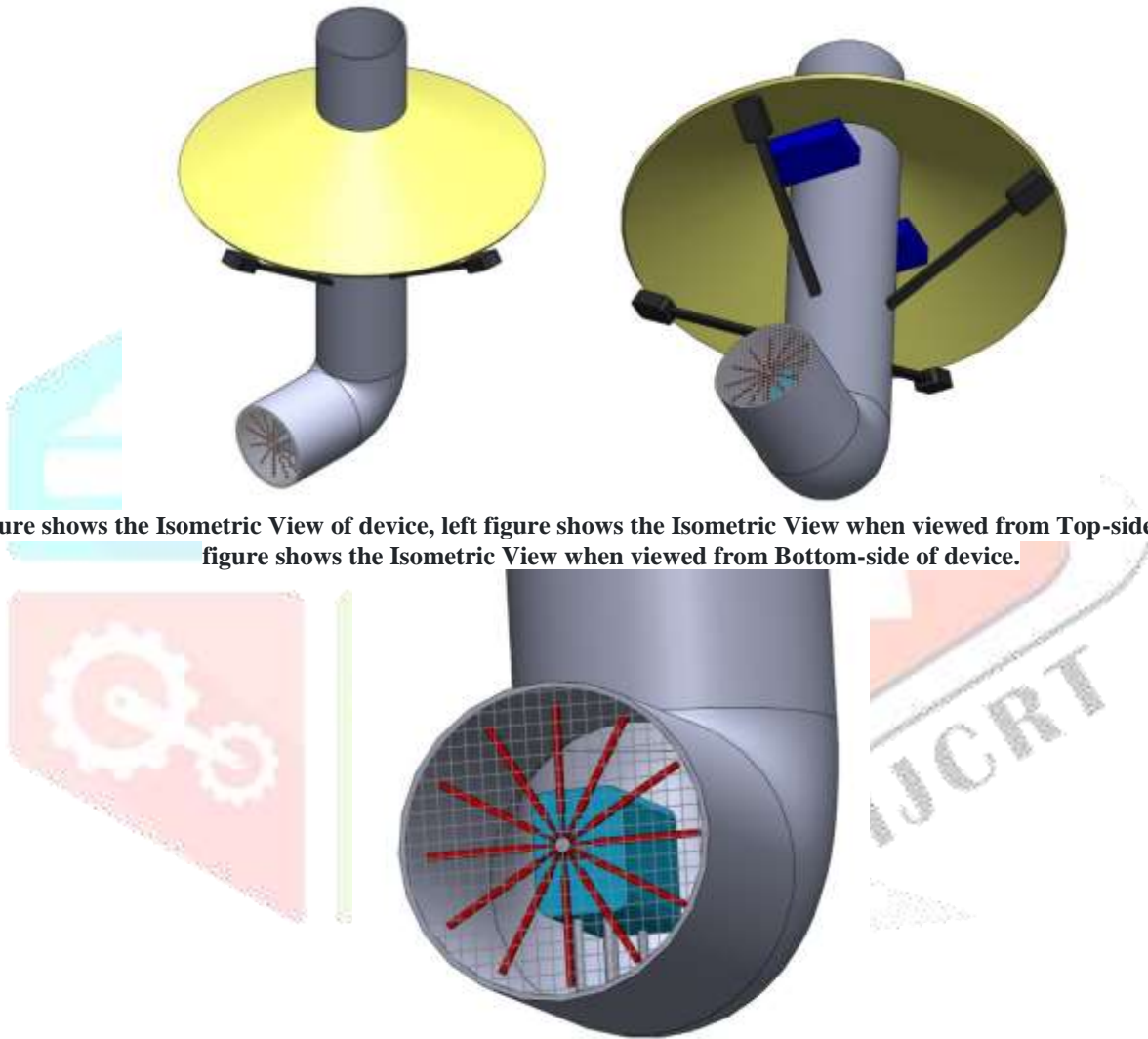


Fig 1. Figure shows the Isometric View of device, left figure shows the Isometric View when viewed from Top-side, while the right figure shows the Isometric View when viewed from Bottom-side of device.

Fig 2. Blades (shown in red color), Motor (shown in blue color), steel mesh in grey (in front of blades) and circular casing duct components are shown in above figure.

An automatic ventilation system with an exhaust fan included with a supply fan is installed in the device. On Traffic signal all engines are generally on idle mode or on first and second gear. This causes more fuel consumption on signals, and the harmful gases released in atmosphere are generally carbon dioxide, carbon monoxides, nitrogen oxides, etc. which are harmful to nearby Human Beings and Animals too.

The device when plugged into power, the fan rotates anti-clockwise and suction pressure is created inside the duct causing is to suck the surrounding air near traffic circles. This sucked air will travel through vertical duct and it will leaves the sucked air nearly at height of 70 ft. on the above atmosphere. Due to this the harmful gases coming out from vehicles standing on signals will be sucked in the duct.

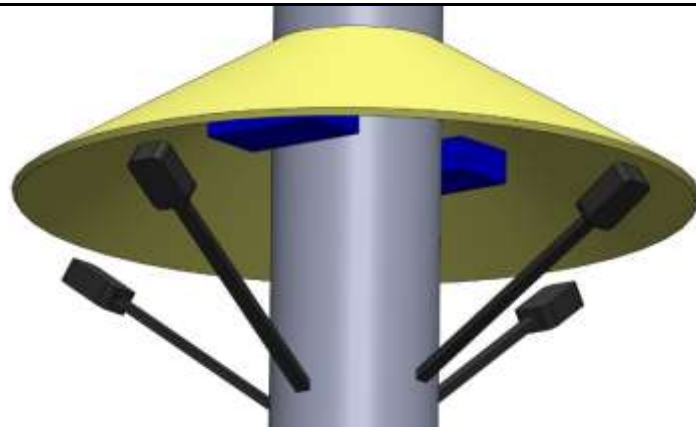


Fig 3. Above figure shows the street lights around the circular duct (shown in dark grey color), circular solar panels (shown in yellow color) and the electronic controlling panel (shown in blue color).

Note: Above 3 figures are 3D models drawn in Solidworks Modelling software.

The device also has attachments of solar panels in circular pattern and the street lights in four directions on the casing of the vertical ducts in an inclined position. This solar panel can be used to lighten up the street lights and to run the fan partially on solar energy. This optimization will help in reducing the energy consumption used by exhaust fans resulting in less power consumption. The device also has a controlling panel and battery storing case at bottom side of solar panels.

The device can be installed in such location that there will the maximum possibilities of high pollution created and which stays in the surrounding for over a period of time. Such location are nothing but in the middle of the traffic circles, along the streets, in middle of the two-way road i.e. in the divider, etc.



Fig 4. Figure shows the animated traffic circle, we can installed the device in the middle of traffic circle, along the roadside and in middle of two-way street i.e. in the divider.

Note: Figure source Google.com



Fig 5. The device can be installed along the red circular highlighted color shown in above figure vertically to get the effective results.

Note: Figure source Google.com

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