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A Research on Development and Fabrication of Aqua Air Purifier

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Abstract: In this paper, design and fabrication of Aqua Air Purifier is discussed which can be used to remove dust as solid PM or fumes and smoke, (which are mixtures of solid and liquid particles) along with biological contaminants, including viruses, bacteria, pollen, molds, dust mite and cockroach body parts, droppings, and animal dander from environmental air within a room. The need for such a system arises from day-to-day requirements in our society. Now a days cities are facing more hazardous environmental air than that of villages so this project is being designed by keeping in mind the need of a townee, the type of pollution faced in cities and the problems caused by such contaminants.

Keywords: Particulate matters, Biological contaminants, HEPA filter, PPM, chlorinated water, AQI etc.

I. INTRODUCTION

Indoor air contaminants have been globally recognized as public health hazards during the last decades. Breathing in tiny liquid or solid particles increases the risk of respiratory complaints, stroke, heart diseases and even cancer. Above mentioned reasons are driving force behind choosing such an affordable Aqua Air Purifier as a topic to work upon. However a lot of advanced devices have already been launched in market but keeping rapidly increasing outdoor and indoor pollution in mind one can feel obvious need of an air purifier which could be afford by majority of city dwelling people. Our project provides a very basic and distinct structure equipped with well-known components which reduces the overall dependency of an air purifier on costly filters and regular service. Since, there are number of air purifiers are already available in the market and they are effective as well but in this context we are looking for an air purifier which is affordable and effective at the same time. We can't deny that quality should be first preference but eyeing at increasing hazardous effects of air pollution and as a consequence increasing number of health related problems do demand a solution which might not as much effective as those costly devices but they could help individuals to have fresh and dust free air.

A. Novelty Statement

Aqua air purifier is not totally dependent upon filters but it mainly purifies the environmental air with the help of water. Investigation and display of inlet air quality. Equipped with automatic power cut facility.

II. LITERATURE REVIEW

A. National Air Quality Index

Awareness of daily levels of air pollution is important to the citizens, especially for those who suffer from illnesses caused by exposure to air pollution. Further, success of a nation to improve air quality depends on the support of its citizens who are well-informed about local and national air pollution problems and about the progress of mitigation efforts. Thus, a simple yet effective communication of air quality is important. The concept of an air quality index (AQI) that transforms weighted values of individual air pollution related parameters (e.g. SO₂, CO, visibility, etc.) into a single number or set of numbers is widely used for air quality communication and decision making in many countries.

B. Identification and Characterization of Particulate Matter Concentrations at Construction Jobsites

The identification and characterization of particulate matter (PM) concentrations from construction site activities pose major challenges due to the diverse characteristics related to different aspects, such as concentration, particle size and particle composition. Moreover, the characterization of particulate matter is influenced by meteorological conditions, including temperature, humidity, rainfall and wind speed. This paper is part of a broader investigation that aims to develop a methodology for assessing the environmental impacts caused by the PM emissions that arise from construction activities. The objective of this paper is to identify and characterize the PM emissions on a construction site with different aerodynamic diameters (PM_{2.5}, PM₁₀, total suspended particulates (TSP)), based on an exploratory study. Initially, a protocol was developed to standardize the construction site selection criteria, laboratory procedures, field sample collection and laboratory analysis.

III. METHODOLOGY

Air purifiers are marketed as a product that can reduce exposure to air pollution, and are sold in upscale electronics shops throughout markets. Recently, demand for air purifiers has increased as more people have become aware of the negative health impacts of exposure to air pollution. However, there is little information on indoor air quality during realistic patterns of air purifier use in highly polluted environments such as Delhi during winter.

Development of entire project is result of various processes in a sequenced manner and a thoughtful observation. Filtration process is done in three stages. In first phase environmental air is sucked by a vertically fitted exhaust fan which is then come into contact with activated carbon filter sheet and then HEPA filter sheet. In second stage this air strikes the roller, these rollers rotate and drag air into the chlorinated water which make air free from bacteria and bio pollution. In the third stage purely clean air comes out from outlet holes.

The proposed project is having sensors to examine the quality of air in terms of PPM of pollutants and accordingly it starts working, also the quality of air could be seen on display which is fitted at one side of assembly. Project is being designed in such a way that there is not a sole burden on one filter only but it distribute load on different layers of filters as well as on chlorinated water.

A. Working Principle

Air purification completed in three stages in the Aqua air purifier.

In first stage of air purification it sucks air from the environment with the help of exhaust fan.

Volume flow rate in exhaust fan is about $14000\text{m}^3/\text{min}$. Then this air is first passed through the activated carbon filter. Carbon filtering is a method of filtering that uses a bed of activated carbon to remove contaminants and impurities, using chemical absorption. It absorbs almost all the virus fungi present in it which absorb all the bad odor from the air.

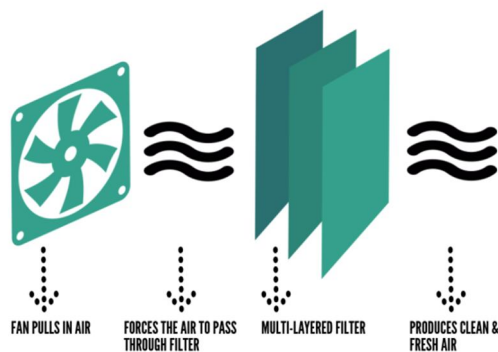


Figure 1. Brief working of Air purifier

In the second stage of air purification this air is first passed through the HEPA air filter.

HEPA (High Efficiency Particulate Arrestance) which can absorb almost 99% efficient and it can absorb all the remaining dust particles from it.

In the third stage of air purification this air is impinges on the rollers which are partially dipped in chlorinated water to absorb all the remaining microbes.

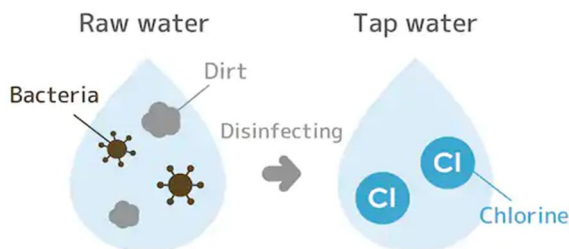


Figure 2. Effect of chlorination of water

In many of the research it is proved that chlorinated water cure the patient who are suffering from the respiratory diseases.

B. Components Used

- 1) Exhaust Fan
- 2) DC Motor
- 3) Gear
- 4) DC Transformer
- 5) LCD Display
- 6) Arduino UNO
- 7) PPM Sensor
- 8) HEPA Filter
- 9) Activated Carbon

C. Process Involved In Fabrication

- 1) *Design Of Purifier Body:* As the crucial part of our project is the outer body of air purifier in which we have to install all the components. Here we have used plywood and aluminum sheet. Plywood is used in the upper half of air purifier and aluminum sheet is used in the lower half of air purifier because we have to make it leak proof.
- 2) *Assembly Of Hepa And Activated Carbon:* As we know that HEPA filters are costlier than the Activated Carbon Filter. Since first we have to install the activated carbon filter because it can absorb all the major dust particles and the virus present in it. In the next stage of air purification we installed the HEPA filter to absorb all the minute particles from it.
- 3) *Design Of Chlorinated Water Tank:* As in third stage of air purification we have to fill water so it must be leak proof and it also have a choke valve for water replacement easily.



Figure-3 Final assembly of Purifier

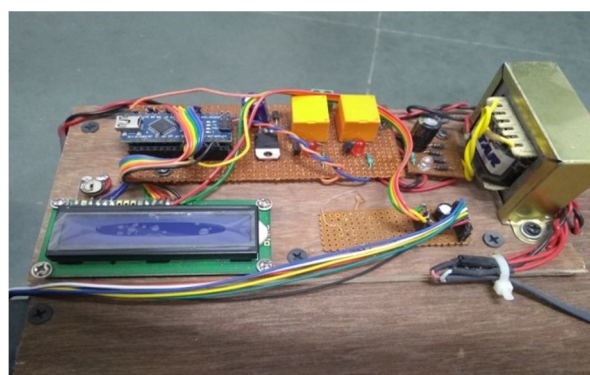


Figure- 4 Electronic assembly of Purifier

D. Advantage

- 1) Since now a days most of the companies are manufacturing air purifier but they are too costly that a normal person cannot afford it so we designed a purifier which is cheap and sustainable for the purification.
- 2) It have chlorinated water solution which can cure the patient who are suffering from the respiratory diseases.

IV. RESULT

From the Air quality index department as we know that air which have 400 ppm level is best for human beings so from our aqua air purifier we can achieve PPM level up to the range of 400.

Since we are using Chlorinated water so that it can also maintains the humidity level of air which is not present in the most of the air purifier which are present in the market now a days.

V. FUTURE PROSPECTUS

- A. Since we are using HEPA filter which is costly so if we find an alternate solution to replace the HEPA air filter and provide an alternative solution for it.
- B. By replacing the HEPA filter we can decrease its cost drastically and to minimize the cost of air purification.
- C. By replacing the AC supply with solar power we can reduce the cost of electricity and to provide green energy to run the air purifier.

VI. CONCLUSION

As we know that continuous use of automobiles and uncontrolled combustion of fuels in industries result in very low AQI in most of the cities.

By using the air purifier we can reduce the problem of respiratory diseases

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