

Modification in Automated Aeroponic Indoor Air Purifier (Pavana) and its Feasibility Analysis

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Abstract: Indoor air pollution is becoming an increasingly genuine issue with the progression of chemical-based building materials as they tend to exert pollutants like benzene, formaldehyde, CO, CO₂ etc. Lot of researchers have produced various ideas of air purifiers concentrated on removing only one or in some cases more than one type of pollutants. But the issue with them is cost, aesthetics, and efficiency in removing multiple pollutants simultaneously. The easiest solution for this can be found in nature. There are several species of plants capable of removing different air pollutants efficiently. Here in this project, we are trying to design an eco-friendly indoor air purifier using bamboo. In this purifier we will be using an aeroponic system for providing water and nutrients to all the plants, which will be removing the pollutants from the air. Aeroponic is a plants cultivation technique in which the roots hang suspended in the air while nutrient solution is delivered to them in the form of fine mist. Depending upon the observed result

Keywords: Pollutant, Purifier, Bamboo, Water, Nutrient

I. INTRODUCTION

Indoor air pollution is becoming an increasingly genuine issue with the progression of chemical-based building materials as they tend to exert pollutants like benzene, formaldehyde, CO, CO₂ etc.

Most common sources of indoor air pollution are Fuel-burning, Tobacco products, Building materials and furnishings, and central heating cooling system.

There are several species of plants capable of removing different air pollutants efficiently.

- Aeroponics is beneficial because of following points
- Pollution and pests are less of a problem due to absence of soil.
- Aeroponics uses as much as 98% less water.
- A vertical design requires 90% less space.

II. THEREOTICAL CONTENT

Common Indoor Air Pollutants

VOC (Volatile Organic Compounds)

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors. VOCs are emitted by a wide array of products numbering in the thousands.

CO (Carbon Monoxide)

Carbon monoxide is produced indoors by combustion sources (cooking and heating) and is also introduced through the infiltration of carbon monoxide from outdoor air into the indoor environment. In homes in developing countries, the burning of biomass fuels and tobacco smoke are the most important sources of exposure to carbon monoxide.

CO₂ (Carbon Dioxide)

Carbon dioxide is a colorless, odorless gas. It is produced both naturally and through human activities, such as burning gasoline, coal, oil, and wood. In the environment, people exhale CO₂ which contributes to CO₂ levels in the air

Aeroponic system

Aeroponic is a technique or subset of that involves growing plants that have their roots suspended in a chamber which is periodically sprayed with nutrient rich mist. In a chamber which is periodically sprayed with nutrient rich mist. Aeroponic has many advantages over conventional way of growing and also over hydroponics. The water consumption is 90% less and it allows for increased oxygen and nutrient intake since the mist particle size is very small. Aeroponics works by using a sprinkler system to spray oxygen and nutrient rich solution on the plant roots.



Figure no 1

Dendrocalamus Giganteus (Giant Bamboo)

Dendrocalamus giganteus also known as Giant Bamboo or Dragon Bamboo is a giant tropical and subtropical clumping species native to India, China, Laos, and Myanmar.

It is considered the second tallest bamboo in the world.



Figure no 2.

Plants that purify air Money plant

Pollutant Removal: While not as efficient as some other plants; Money Plants have the ability to remove certain indoor air pollutants like formaldehyde, benzene, and xylene to a certain extent. **Availability:** Money Plants are widely available and can be found in nurseries, garden centers, and even online stores. They are a popular choice for indoor plants and can also be grown outdoors in suitable climates.



Figure no 3

III. RESULT

Pollutant concentration

(PM 1) :- PM 1 concentration is under standard limits given by device manual and by use of filter PM1 is within limit.

(PM 2.5) :- PM 2.5 concentration is exceeding without filter than standard limits given by device manual and by use of filter PM 2.5 is within limit.

(PM 10) :- PM 10 concentration is exceeding without filter than standard limits given by device manual and by use of filter PM 10 is within limit.

Duration	PM10	PM2.5	PM1.0
Standard	15	15	30
without	29.49246	25.01273	21.12817

Table no .1

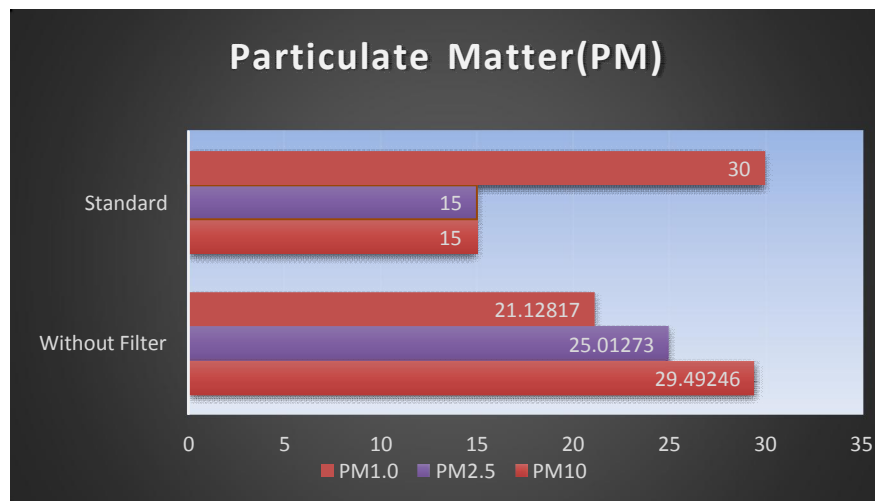


Fig No.4 Graph showing concentration of particulate matter

Carbon Dioxide (CO₂) :- CO₂ concentration is exceeding without filter than standard limits given by device manual and by use of filter CO₂ is within limit.

Duration	CO2
Standard	700
without	443.5283

Table no .2

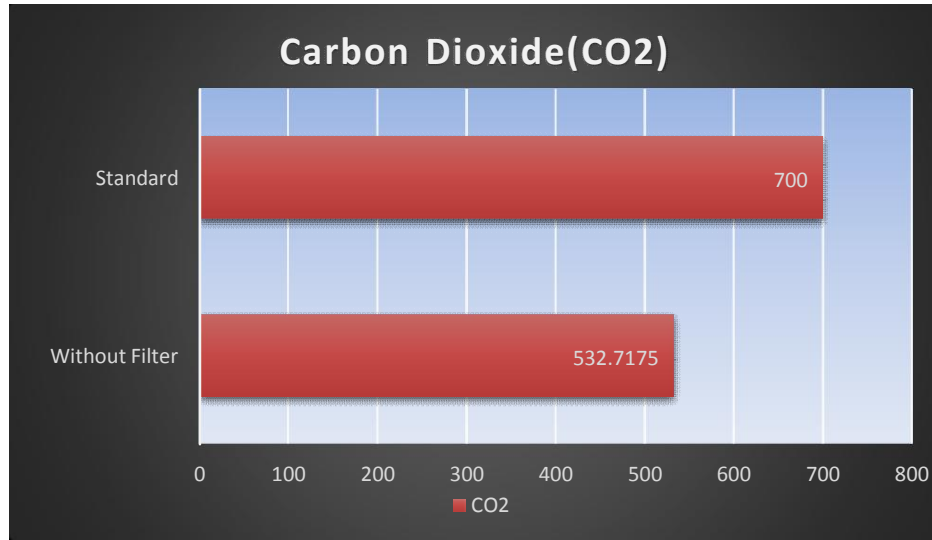


Fig No.5 Graph showing concentration of Carbon dioxide (co₂)

Volatile organic compound (VOC): - VOC concentration is exceeding without filter than standard limits given by device manual and by use of filter VOC is within limit.

Duration	VOC
Standard	0.22
without	0.418704

Table no. 3

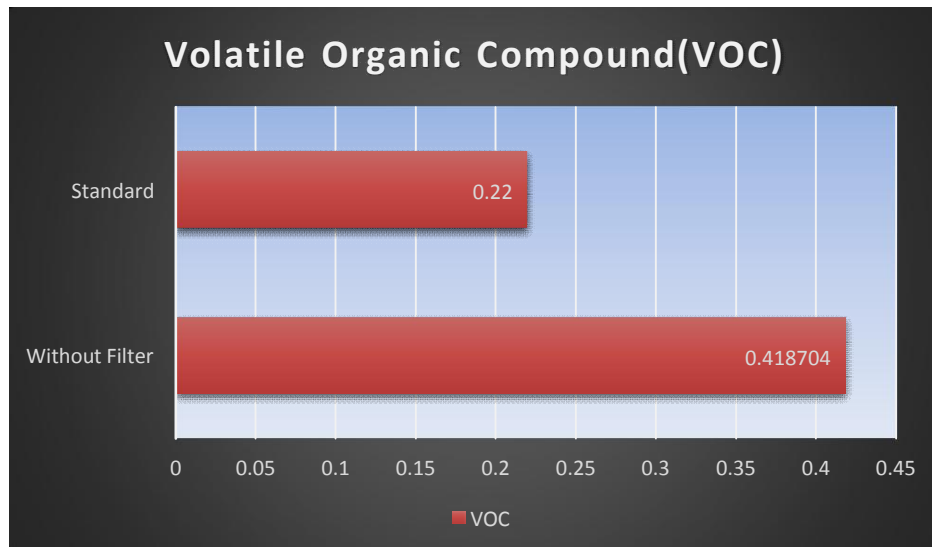


Fig No 6. Graph showing concentration of Volatile Organic compound (VOC)

IV. CONCLUSION

As per result this project has potential to reduce indoor air pollutant concentration. There is still scope impervious by researching with different type of plant and most environment friendly material and this hopefully improve the result As we used most of material environment friendly so the device is considered partially environment friendly. So most alternate eco-friendly material are available.

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